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HUMAN FACTORS ANALYSIS AND MODELING OF U.S. NAVY AFLOAT ELECTRICAL SHOCK MISHAPS

by

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Electrical shock mishaps account for 33 percent of all personnel injuries occurring onboard U.S. Navy surface combatants from 1995 to 1997. Clearly this indicates a need to identify the root causes and to develop intervention strategies for preventing electrical shock. Electrical shock root causal factors are identified through the evaluation of Special Case Mishap Reports maintained by the Naval Safety Center. Analysis indicates that over 85 percent of electrical shock mishaps are human factors related. Scenario analysis coupled with categorical data analysis is used to identify human factors patterns that are present in electrical shock mishaps. This human factors approach finds that the failure of two primary human factors related interventions identified in the safety literature, improper tagout of equipment and misuse of personal protective equipment, account for 37 percent of the mishaps. A stochastic model of electrical shock mishaps, including human factors related and non-human factors related mishaps, is constructed to develop an overall impression of the status quo. This model is then used to forecast the impact of correcting the identified failed interventions on future expected mishap frequencies and associated costs.

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HUMAN FACTORS ANALYSIS AND MODELING OF
U.S. NAVY AFLOAT ELECTRICAL SHOCK MISHAPS

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ABSTRACT

Electrical shock mishaps account for 33 percent of all personnel injuries occurring onboard U.S. Navy surface combatants from 1995 to 1997. Clearly this indicates a need to identify the root causes and to develop intervention strategies for preventing electrical shock. Electrical shock root causal factors are identified through the evaluation of Special Case Mishap Reports maintained by the Naval Safety Center. Analysis indicates that over 85 percent of electrical shock mishaps are human factors related. Scenario analysis coupled with categorical data analysis is used to identify human factors patterns that are present in electrical shock mishaps. This human factors approach finds that the failure of two primary human factors related interventions identified in the safety literature, improper tagout of equipment and misuse of personal protective equipment, account for 37 percent of the mishaps. A stochastic model of electrical shock mishaps, including human factors related and non-human factors related mishaps, is constructed to develop an overall impression of the status quo. This model is then used to forecast the impact of correcting the identified failed interventions on future expected mishap frequencies and associated costs.

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LIST OF ACRONYMS

CGUS	Comptroller General of the United States
CNO	Chief of Naval Operations
CYxx	Calendar Year xx
CYxx$	Constant Year xx Dollars
DOD	Department of Defense
DON	Department of the Navy
FAT	Fatality
MSC	Military Sealift Command
NAVOSH	Navy Occupational Safety and Health
NAVSAFECEN	Naval Safety Center
NSC	National Safety Council
NCIS	National Council of Industrial Safety
OSHA	Occupational Safety and Health Administration
PPD	Permanent Partial Disability
PTD	Permanent Total Disability
PPE	Personal Protective Equipment
SECNAV	Secretary of the Navy
SCM	Special Case Mishap
TAR	Training and Administration of the Reserves
USNS	United States Naval Ships

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EXECUTIVE SUMMARY

Personnel fatalities and injuries can dramatically affect U.S. Navy unit mission capability and operational readiness. Notably, electrical shock mishaps account for 33 percent of all personnel injuries occurring onboard U.S. Navy surface combatants from 1995 to 1997. Clearly this indicates a need for root cause identification and development of intervention strategies to prevent electrical shock. Post-hoc analysis of 897 Special Case Mishap Reports maintained by the Naval Safety Center, involving 927 personnel receiving an electrical shock from 1 January 1995 to 31 December 1997 is conducted in response to this need. The analysis includes initial data exploration, a human factors analysis, and stochastic modeling.

Clearly, initial data exploration and a human factors analysis permits salient features and predictive patterns to be identified in electrical shock mishaps. Aircraft Carriers, possessing the largest crew of any naval vessel, account for the highest number of mishaps (32.0%). The E-3, E-4, and E-5 rates are typically those that perform maintenance or other work activity with associated electrical hazards, and are the most common victims of electrical shocks (76.3%). The Navy's "electrical ratings", EM, AT, and ET, are 3 of the top 4 ratings involved in electrical shock mishaps. The fourth rating, MM, routinely works with electrical components or hazards in the engineering spaces.

The human factors concept of scenario analysis is invaluable in determining the root causes of electrical shock mishaps. Most victims (37.0%) are found to be not following rules and regulations since the two primary human factors causes relate to failed electrical hazard interventions: improper tagout of equipment and misuse of PPE. In addition, many personnel (21.5%) are not taking shipboard safety regulations seriously

since a victim's inattentiveness, complacency, or violations account for a significant number of the remaining events.

Stochastic modeling is a valuable tool and proves statistically that the mishap arrival process can be estimated. As demonstrated in previous mishap studies, modeling mishap events using a Poisson process is an effective technique. Once constructed, the model provides the means to predict expected future mishap frequencies and associated costs. The impact of correcting failed electrical hazard human factors related interventions, on future mishap frequencies and associated costs, can be evaluated using the electrical shock mishap model formulated. This study indicates mishap events can be reduced by 19 percent (56 events) in one year with a 50 percent reduction in the failure of personnel to wear PPE or properly tagout equipment. In addition, the model indicates personnel injury costs alone will total over $1,000,000 in the next 5 years without interventions.

Post-hoc mishap analysis is only as good as the initial mishap report. The current instruction governing afloat mishap investigation and reporting, OPNAVINST 5100.19C, provides a format for reporting what happened but lacks direction on reporting why the mishap occurs. Since this research shows over 85 percent of electrical shock mishaps are attributable to human error, the why of a mishap is necessary to conduct a human factors analysis for root cause identification. It is recommended that NAVSAFECEN revise OPNAVINST 5100.19C and provide better guidance for reporting why the mishap occurred.

NAVSAFECEN should continue their outstanding approach in providing the fleet with shipboard safety issues through Ship's Safety Bulletins issued monthly and their

award winning Fathom Magazine issued bi-monthly. For the prevention of electrical shock mishaps, the bulletins and magazines can focus on the Navy's Tagout and PPE Programs in addition to basic shipboard electrical safety. NAVSAFECEN has already commenced this approach and initial data exploration of CY98 data indicates a reduction in the average number of electrical shock mishap events occurring onboard surface combatants.

Finally, there are other high interest personnel injury mishaps that can be pursued. Back injury and toxic substance exposure contribute significantly to the total number of mishaps occurring annually onboard Navy surface combatants. This research indicates mishap events can be stochastically modeled, and through human factors analysis, root causes of mishaps can be identified and subsequently, intervention strategies can be considered, implemented, and evaluated for their effectiveness on future mishap frequencies and associated costs.

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I. INTRODUCTION

A. OVERVIEW

As the U.S. Military moves into the new millennium, technological advances of the twentieth century have enhanced overall force combat readiness. Operational commitments, combined with major draw-downs and budget constraints, heighten the importance of asset availability and preservation. Under such conditions much attention is given to the loss and damage of capital resources, such as aviation and maritime assets, however, relatively little attention is given to personnel fatalities and injuries. Daily, Naval personnel fatalities and injuries occur in a variety of routine activities due to the hazards they are confronted with in the workplace (Naval Safety Center, 1998). Numerous private industry studies indicate that job related fatalities and injuries can be reduced through human factors analysis, which is not only cost effective but humanitarian as well (Drury & Brill, 1983).

Personnel injuries can dramatically affect U.S. Navy unit mission capability and operational readiness. Notably, electrical shock mishaps account for 33 percent of all personnel injuries occurring onboard Department of the Navy (DON) combatants from 1995 to 1997. Clearly this indicates a need to prevent electrical shock through root cause identification and the advent of tailored intervention strategies. The intent of this study is to identify electrical shock incident root causes through the evaluation of Special Case Mishap Reports, and once identified, model the occurrence of electrical shock, identify those incidents with human factors root causes, select interventions for them, and estimate their potential impact on future mishap frequencies and associated costs.

Traditionally, accident investigation and analysis focused solely on personnel, particularly those who might be accident prone and blamed for them (Pimble & O'Toole, 1982). More recently, accident investigators tend to be operators and engineers rather than trained human factors professionals, who focus their attention on carelessness, inattention, etc., that lead to mishaps. The combination of their two perspectives has precluded effective post-hoc accident data analysis and prevented the determination of the root causes of accidents (Shappell & Wiegmann, 1997a).

Numerous techniques have been used to pinpoint accident causation. Techniques range from basic statistical analysis of categorical data to the development of a full-blown model of accident occurrence (Ramsey, 1973). These analyses tend to be static and usually do not capture the dynamics of the accident itself (Laughery, Petree, Schmidt, Schwartz, Walsh & Imig, 1983). Through a systematic examination of accident analysis, the "how" of a mishap sequence can be identified. Classic human factors techniques are based on task analysis, which depicts the sequence of events for a work activity and provides such a perspective.

One effective human factors technique is scenario analysis, which uses a task analytic process to examine human factors data in accident cases to identify hazard patterns or "scenarios" (Drury & Brill, 1983). Scenario analysis of 1,874 industrial accidents occurring at a large petro-chemical manufacturing complex found that machinists and pipefitters account for almost 25 percent of the accidents while assembling or disassembling equipment (Laughery et al., 1983). Another scenario analysis of 448 eye injury cases indicates over 95 percent of personnel suffering eye injuries complied with the company's area based protective wear policy (Schmidt, Petree

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& McDaniel, 1984). A follow-on scenario analysis of 229 back injuries found that 72 percent of the injuries are a direct result of overexertion (Laughery & Schmidt, 1984). Finally, a scenario analysis of 4,923 industrial accidents identifies five scenarios, which account for over 16 percent (804) of the accidents (Laughery & Brems, 1985). The common foundation is that all these studies of injuries in the petro-chemical industry are able to identify very clear-cut patterns among the data sets analyzed, which produces an understanding of an accident event's dynamics, the first crucial step in classifying root human cause factors. Once these factors are classified, they can be modeled, and subsequently potential intervention strategies can be evaluated to assess their impact on future accident frequencies, rates, and costs.

B.   BACKGROUND

The Naval Safety Center (NAVSAFECEN), which is located at the Norfolk Naval Air Station, Virginia, has three directorates: aviation, afloat, and shore safety, and five support departments. The directorates work both independently and as a team to help the Chief of Naval Operations and the Commandant of the Marine Corps prevent operational mishaps, promote safety, and monitor safety programs. Through their involvement in all phases of safety, NAVSAFECEN develops recommendations for formulating safety policy necessary to maintain the highest level of combat readiness (NAVSAFECEN, 1997).

NAVSAFECEN staff collects, evaluates and distributes information about operational and occupational mishaps. The command maintains a computerized repository of injury, occupational illness, and property damage reports as well as publishes statistical data derived from those reports. Some staff members directly or

indirectly assist in incident investigations to determine causes and subsequently to recommend policies that will prevent similar ones in the future. Several NAVSAFECEN personnel also conduct safety surveys of operational commands to evaluate their safety programs and practices to make recommendations for improvements (Ibid, 1997).

Recently, Lacy (1998) conducted a human factors analysis of major U. S. Navy afloat (e.g. ships and submarines) mishaps. His study focuses on Class A afloat mishaps and encompassed 46 mishaps over a four-year period involving a combination of ship collisions, vessel groundings, and personnel fatalities. The Navy classifies mishaps according to accident severity, and mishaps are classified as Class "A", "B", or "C", depending on the dollar value reached and/or involvement of personnel fatalities/injuries (see definitions page 6). Specific human causal factors contributing to the occurrence of mishaps are identified, underscoring a need to incorporate a human factors approach in mishap data analysis. He asserts once such causal factors are identified, tailored intervention strategies can be developed and implemented to potentially prevent related mishap occurrence. He provides NAVSAFECEN with recommendations for revisions to the Navy's instruction governing mishap investigation and reporting (DON, 1997a), to assist investigators in analyzing afloat mishaps and their subsequent development of tailored interventions.

Currently, there is an extreme interest in a separate type of afloat incidents, known as Special Case Mishaps (SCM's). SCM's involve: (1) electrical shock; (2) hazardous material, chemical or toxic exposure requiring medical attention; (3) back injury requiring medical attention; and (4) explosives, oxidizers, incendiaries, explosive systems or chemical warfare agent incidents (DON, 1997a). SCM's may be classified as

Class A, B, or C, depending on the severity of the incident, however most do not reach those levels. Mainly they involve personnel injuries at a rate of roughly 300 mishaps per category per year. Although SCM's are primarily Class C or less in severity, their impact on personnel and combat readiness is significant (CDR Rowe, personal communication, May 20, 1998).

Aside from taking a human factors perspective in conducting mishap data analysis, the use of modeling procedures in concert with it is being embraced. Schmorrow (1998), in an analysis of maintenance related mishaps, uses a human factors analysis approach to identify patterns and potential interventions. Subsequently, he estimates the impact of those human factors interventions through stochastic modeling techniques. His models indicate that reducing human error types as low as 10 percent can result in a savings in excess of millions of dollars per year. Such a process has long been called for in the literature (Mintz, 1954; Teel & Du Bois, 1954).

C.   OBJECTIVE

The purpose of this study is to conduct a human factors analysis of electrical shock mishaps to identify salient patterns present in electrical shocks. Further, electrical shock mishaps are stochastically modeled and subsequently used to evaluate the potential impact of intervention strategies on mishap event frequencies and associated costs.

D.   PROBLEM STATEMENT

This research addresses electrical shock mishaps and their affect on the operational readiness of U.S. Navy ships. The study identifies the human causal factors contributing to electrical shocks and investigates the following questions:

1. Can electrical shock mishaps be classified through human factors analysis, permitting salient features and predictive patterns to be identified?

2. Can a stochastic model of electrical shock mishaps, composed of human factors involvement/non-involvement, be constructed to model the status quo?

3. Can potential intervention strategies be identified for the primary human factors patterns found?

4. Can the intervention strategies for human factors related electrical shock mishaps be evaluated through modeling to assess their subsequent impact on mishap frequencies and associated costs?

E.   DEFINITIONS

This study uses the following definitions (DON, 1997a):

1. <u>Class "A" Mishap</u>.   A mishap involving one or more of the following: (1) $1,000,000 in property damage; (2) loss of life; (3) permanent disability.

2. <u>Class "B" Mishap</u>.   A mishap involving one or more of the following: (1) between $200,000 and $1,000,000 in property damage; (2) permanent partial disability; (3) hospitalization of five or more people.

3. <u>Class "C" Mishap</u>.   A mishap involving one or more of the following: (1) between $10,000 and $200,000 in property damage; (2) an injury preventing an individual from performing regularly scheduled duty or work beyond the day or shift on which it occurred; (3) nonfatal illness or disability causing loss of time from work or disability at any time (lost time case).

4. <u>Class "D" Mishap</u>. Special Case Mishaps not meeting the reporting criteria of Class A, B, or C.

F.   SCOPE AND LIMITATIONS

This study examines all reported electrical shock incidents occurring onboard U.S. Navy ships to both active duty, training and administration of the reserves (TAR), and reservist personnel in the U.S. Navy and U.S. Marine Corps between 1 January 1995 and 31 December 1997. The focus of this study is electrical shock incidents attributable to human causal factors. The intent of the next chapter is to provide a framework for understanding the occurrence and prevention of electrical shock mishaps onboard U.S. Navy surface ships. Chapter III provides a discussion of the methodology used in this study.   Results of data exploration, human factors analysis and stochastic modeling are provided in Chapter IV. Finally, a research summary, conclusions, and recommendations are provided in Chapter V.

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II. LITERATURE REVIEW

A. OVERVIEW

The intent of this chapter is to provide a framework for understanding the occurrence and prevention of electrical shock mishaps onboard U.S. Navy surface ships. Thus, a detailed review covering the subjects of accident prevention, causation, investigation, reporting, and analysis is provided. The Occupational Safety and Health Act and the Department of the Navy Occupational and Safety Health Program are then covered. Finally, an in-depth review is provided on electrical hazards and safety.

B. ACCIDENT

McElroy (1974) defines an accident in its broad scope as:

> An unplanned, not necessarily injurious or damaging event, that interrupts the completion of an activity; it is invariably preceded by an unsafe act or an unsafe condition or both, or some combination or unsafe acts and/or unsafe conditions. (p. v)

This research focuses on personnel injury and considers a more specific definition of an accident as defined by Heinrich, Peterson, and Roos (1980):

> An unplanned and uncontrolled event in which the action or reaction of an object, substance, person, or radiation results in personal injury or the probability thereof. (p. 23)

Clearly, the prevention of accidents is a desirable goal in any organization (Lacy, 1998).

C. ACCIDENT PREVENTION

Hammer (1976) contends safety programs are undertaken to prevent accidents for three fundamental reasons:

1. Moral: accident prevention is undertaken to prevent injury to personnel purely as the result of humane considerations.
2. Legal: federal, state, and municipal requirements must be observed or penalties may be assessed for noncompliance.

3. Economic: consideration is given to those monetary losses which could result from injury to personnel and, in addition, from property damage, destruction of material, interruption of operations, and other factors. (p. 8)

However, this has not always been the case. In 1893, for example, during the consideration of the Railway Safety Act, a company executive stated that it would cost less to bury a man killed in an accident than to put air brakes on a car (Hammer, 1976). One hundred years later such a statement would be considered a blatant disregard for human life and lead to serious legal trouble. During the Industrial Revolution hazardous working conditions were the accepted norm. Today, failure to try to prevent injuries to employees would be viewed as indefensible in court (McElroy, 1974).

The first factory safety inspections did not occur until 1867 in Massachusetts and were driven by protests of dangerous machinery creating hazardous working conditions. From 1867 until 1912 little progress was made in industrial safety with the exception of the first officially recorded safety program in 1892 and the idea of workers compensation in 1908. In 1912 the First Cooperative Safety Congress met in Milwaukee, and as a result the modern safety movement was born in 1913 with the formation of the National Council of Industrial Safety (NCIS). NCIS changed its name to the National Safety Council (NSC) in 1915 and broadened its program to include all aspects of accident prevention (McElroy, 1974).

The balance of the early 20th century saw the federal government begin to actively lobby for industrial safety. The major emphasis of this era was on the "Three E's of Safety" – engineering, education, and enforcement, which were incorporated into early safety programs. Engineers focused on design improvements, in both product and process, whereas industries reached their employees through education and the

enforcement of established safety rules (Goetsch, 1996). The work of a few individuals devoted to industrial safety with the NSC's birth grew to millions by 1950. McElroy (1974) depicted the impact of the safety movement by the end of World War II with a quote by retired Admiral Ben Moreell, the then president of Jones and Laughlin Steel Corporation: "If we can't afford safety, we can't afford to be in business." (p. 7)

Today, NSC is the largest organization in the United States devoted solely to health and safety practices and procedures (Goetsch, 1996). As a result of NSC's efforts in the 20th century, an employees chances of being killed in an industrial accident are less than half they were 60 years ago (Society of Manufacturing Engineers, 1989). The current death rate from work-related injuries is approximately 4 per 100,000, less than a third of the rate 50 years ago (NSC, 1990). However, in the United States there are an estimated 100,000 people accidentally killed and over 104 million accidentally injured at a cost of over 90 billion dollars each year (Ferry, 1988). Therefore, given the still high number of fatalities and injuries, there is a clear need for the sustained development of accident prevention strategies.

D.   OCCUPATIONAL SAFETY AND HEALTH ACT

Prior to 1970, few laws existed governing health and safety in an occupational environment. In 1957, the manufacturing injury rate was 11.1 lost-time injuries per million man-hours and by 1970 this rate had risen to 15.2 (Smith, 1976). In addition, the United States faced the following annual occupational figures in 1970 (U.S. Department of Labor, 1995):

1. Job-related accidents accounted for more than 14,000 worker deaths
2. Nearly 2 ½ million workers were disabled
3. Ten times as many person-days were lost from job-related disabilities as from strikes

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4. Estimated new cases of occupational diseases totaled 300,000 (p. 1).

The U.S. Congress, concerned with this declining trend of health and safety standards for employees, passed the Occupational Safety and Health Act of 1970. The purpose of the act as cited by McElroy (1974) was "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources" (p. 21). The act was signed into law by President Nixon on 19 December 1970 and took effect 28 April 1971.

"OSHA" or the Occupational Safety and Health Administration was established in 1970 as part of the 1970 Act and serves as the federal government's administrative arm under the U.S. Department of Labor (Goetsch, 1996). Pressured by Congress and labor groups on one hand to provide the highest degree of health and safety and by businesses on the other who bear the monetary costs of programs, OSHA is faced with a very difficult task (Smith, 1976).

The OSHA Act applies to any employer with one or more employees, with the exception of those who are self-employed persons, work on family farms who employ only immediate family members, and federal agencies covered by other federal statutes (U.S. Department of Labor, 1995).

Goetsch (1996) summarizes OSHA's mission and purpose as follows:

1. Encourage employers and employees to reduce workplace hazards
2. Implement new health and safety programs
3. Improve existing health and safety programs
4. Encourage research that will lead to innovative ways dealing with workplace health and safety problems
5. Establish the rights of employers regarding the improvement of workplace health and safety
6. Establish the rights of employees regarding the improvement of workplace health and safety

7. Monitor job-related illnesses and injuries through a system of reporting and record keeping
8. Establish training programs to increase the number of health and safety professionals and to continually improve their competence
9. Establish mandatory workplace health and safety standards and enforce those standards
10. Provide for the development and approval of state-level workplace health and safety programs
11. Monitor, analyze, and evaluate state-level health and safety programs (p. 52).

These goals enable both employees and employers to understand their rights and responsibilities pertaining to safety. Through the enforcement of these standards, effective safety programs can be established providing both a safe working environment for the employees and a cost-effective and moral business operation for the employer.

Prior to the establishment of OSHA, no centralized database of occupational safety and health issues was maintained for analysis. The OSHA Act mandates records of occupational injuries and illnesses be maintained. An occupational injury, as defined by the U.S. Department of Labor (1995) is "any injury such as a cut, fracture, sprain or amputation that results from a work-related accident or from exposure involving a single incident in the work environment" (p. 12) and an occupational illness is "any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment" (p. 12). OSHA requires:

All occupational illnesses must be recorded regardless of severity. All occupational illnesses must be recorded if they result in:
1. Death
2. One or more lost workdays
3. Restriction of work or motion
4. Loss of consciousness
5. Transfer to another job
6. Medical treatment (other than first aid) (p. 13).

Through the collection of these health and safety statistics, OSHA has formed a centralized database for the analysis of accident records and the development of subsequent intervention strategies to prevent future occupational accidents.

The problem is studies indicate OSHA is not making use of its database. The Comptroller General of the United States (CGUS) (1979), in a report to the Congress, indicated "OSHA has information in its files on the causes of serious work-related accidents yet is not using this to develop measures to prevent accidents from recurring" (p. i). The CGUS contends that the coding scheme OSHA uses to enter accident data into its database does not provide the detail required to identify accident causes and trends accurately. The CGUS recommends OSHA refines its data collection system and makes greater use of information pertaining to serious accidents through revised reporting procedures, the establishment of hazard lists warranting special attention, and by providing training and education on the causes of fatal and other serious accidents to industries and labor.

E.   ACCIDENT CAUSATION

Prior to the implementation of measures to prevent accidents, decision-makers must understand why they occurred. The most common theme across theories of accident causation was summarized by Hammer (1972):

> Man as a hazard...almost every mishap can be traced ultimately to personnel error, although it may not have been error on the part of the person immediately involved in the mishap. It may have been committed by the designer, production worker, maintenance man, or almost anyone other than the person present when the accident occurred. (p. 68)

Goetsch (1996) lists the most common theories of accident causation as: (1) Domino Theory; (2) Human Factors Theory; (3) Accident/Incident Theory; (4) Epidemiological Theory; and (5) Systems Theory.

1.   Domino Theory

Heinrich et al. (1980) developed one of the earliest and most common theories of accident causation. An accident can be viewed as such a sequence with five factors or "dominoes" reacting with the end result being an injury. These five factors are: (1) ancestry and social environment; (2) fault of person; (3) unsafe act and/or mechanical or physical hazard; (4) accident; and (5) injury. The two central points that are key to this theory are; (1) injuries are caused by the action of preceding factors; and (2) removal of the central factor (unsafe act/hazardous condition) negates the action of the preceding factors and thereby prevents accidents and injuries (Goetsch, 1996).

2.   Human Factors Theory

Human factors models of accident causation focus on a chain of events leading to an accident with the root cause lying in some form of human error. Popular human factors theories include Adjustment Stress and the Ferrell theory. Adjustment Stress theory attributes stress factors, both internal and external to the workplace, to the causation of accidents. These factors may include excessive working space temperatures or physical requirements in the work area, an alcohol or drug addiction, or a realm of other stresses negatively contributing to a workers performance. The primary concept is an abundance of these stresses overloads the worker and leads to an accident (Heinrich, Peterson & Roos, 1980). Ferrell developed his theory, which states that accidents are the

result of a causal chain, with one or more of the causes being human error. This human error is caused by one of three situations as summarized by Heinrich et al. (1980):

1. overload which is the mismatch of a human's capacity and the load to which he is subjected in a motivational and arousal state
2. incorrect response by the person in the situation which is due to a basic incompatibility to which he is subjected
3. an improper activity that he performs either because he didn't know any better or because he deliberately took a risk. (p. 46)

Clearly roots of human error found in accidents can be the result of an individuals actions or inactions.

3. Accident/Incident Theory

Peterson (1975), adopting concepts from Ferrell, developed the accident-incident theory of accident causation. This model states that there are two causes for accidents: human error and/or systems failure. Accident causes can come from either or both (Heinrich, Peterson & Roos, 1980). Human error is classified into three broad categories: (1) overload; (2) ergonomic traps; and (3) decision to err. The concepts of overload and ergonomic traps follow Ferrell's model closely, however, Peterson introduces two new concepts of systems failure and decision to err. The systems failure component explains an organizations managerial contribution to safety practices, such as policy/standards and training and corrective measures. Decision to err is a form of human error which may be conscious and based on logic or simply unconscious (Goetsch, 1996).

4. Epidemiological Theory

Epidemiology is the study of the factors controlling the presence or absence of a disease or pathogen (Woolf, 1980). In the study of accident causation, these factors are viewed as environmental factors in the workplace, which contribute to the occurrence of an accident. Epidemiological theory uses models to study the causal relationships

between these environmental factors and accidents (Colling, 1990). The key components of this theory are predisposition characteristics and situational characteristics. The combination of these components may result in or prevent an accident (Goetsch, 1996). Suchman (1961) proposed epidemiology model states that predisposition characteristics (susceptible hosts such as people or a hazardous environment) interacting with situational characteristics (risk-taking or peer pressure) results in accident conditions (the unexpected, unavoidable, or unintentional) producing accident effects (injury or damage).

5. **Systems Theory**

A system is a group of interrelated, interacting, or interdependent components that together form a complex whole (Woolf, 1980). The systems theory of accident causation views these components as people, machinery, and the environment, which interact together to form a system capable of producing an accident (Firenzie, 1971). How these components interact increases or decreases the probability of an accident event occurring. Firenzie (1978) developed the most popular systems theory model whose primary components are the person/machine/environment, information, decisions, risks, and the task to be performed. The premise of this model is that a person must interact with a machine or tool in the environment when performing a task. Prior to performing the task, the person must collect information, weigh risks, and decide whether or not to perform the task. Firenzie (1978) asserts that factors which must be considered when collecting information, weighing risks, and making decisions include: (1) job requirements; (2) the workers abilities and limitations; (3) what is gained if the task is successfully accomplished; (4) what is lost if the task is attempted but fails; and (5) what is lost if the task is not attempted. These factors enhance the decision making process of a worker and

allow for a more favorable interaction of system components within a working environment. This favorable interaction reduces the probability of accident occurrence.

The theories of accident causation previously discussed develop models to explain the occurrence of accidents. When comparing theory with reality, often an accident situation may not fit a particular model of accident causation. The accident cause may combine parts of several different models. The combination theory of accident causation explain accidents which occur as a result of a combination of several different causal factors (Goetsch, 1996).

F. ACCIDENT INVESTIGATION

Accident investigation serves as the primary tool for the identification of causes contributing to an accident. Once these causes are identified, corrective measures can be taken to preclude similar accidents from occurring in the future. The quality of the accident investigation process and the information obtained from it will determine the success of corrective measures (Hill, Byers, Rothblum, & Booth, 1994). Therefore, it is imperative that accident investigators are properly trained in accident investigation procedures (Raby & McCallum, 1997).

Personnel conducting accident investigations range from untrained persons with limited resources working alone to large investigative teams of experts with unlimited resources (Ferry, 1988). Typically, accident investigations are conducted by personnel with very little training or background in investigative procedures (Ferry, 1985). For example, when personnel injuries occur at U.S. Navy units, investigative procedures are required to produce the proper reports. These personnel injuries may range from a work-related injury on-duty to a motorcycle accident off-duty. Normally, the investigation and

reporting requirements are randomly assigned to an available officer stationed at the unit who typically possesses no training in investigative procedures (CDR Rowe, personal communication, May 20, 1998).

Accident investigators tend to have preconceived notions and perceptions which cloud their judgment when performing an accident investigation (Benner, 1982). The goal of any accident investigative procedure is to collect as much factual information as possible pertaining to the occurrence of the accident. Preconceived notions and perceptions by the investigator can lead to a fault-finding investigation focusing on placing blame or identifying a "scape goat". In turn, witnesses may be less inclined to reveal critical information pertaining to the actual causes of an accident (McElroy, 1974; Goetsch, 1996).

Regardless of the reason for an investigation, investigators must ask the questions: what happened, why did it happen, when did it happen, where did it happen, how did it happen, and who was involved? (Benner, 1975). This unbiased fact finding approach allows for the identification and collection of accident causes, the primary focus of an accident investigation. NSC (1991) provides the best overview of this philosophy and technique:

> As you investigate, don't put the emphasis on identifying who could be blamed for the accident. This approach can damage your credibility and generally reduce the amount and accuracy of information you receive from workers. This does not mean you ignore oversights or mistakes on the part of employees nor does it mean that personal responsibility should not be determined when appropriate. It means that the investigation should be concerned with only the facts. In order to do a quality job of investigating accidents you must be objective and analytical. (p. 69)

Investigators must remain open-minded and objective during the investigation. They must be viewed by workers as a separate entity from any punitive or administrative board

involved in the investigation (McElroy, 1974). This approach creates a perception of fairness by the workers and lead investigators to the key facts surrounding the accident scenario.

A human factors contribution to an accident consists of an individuals decisions, actions, or inactions directly linked to the series of events leading to the accident (Raby & McCallum, 1997). Estimations of accident causes attributable to human factors average 75 percent and in some cases as high as 90 percent (Perrow, 1984; Reason, 1990). For this reason, Mayer and Ellingstad (1992) assert that a human factors analysis must be conducted in conjunction with the fact-finding basis of an accident investigation. With a trend of accident investigators, who typically possess little knowledge or training in accident investigation, lies the inherent and compounding problem of investigators with literally no experience in human factors analysis. This confound may lead investigators to targeting an easy human cause factor (e.g. operator error) rather than probing below the surface for the underlying cause such as inadequate equipment design (Hill, Byers, Rothblum, & Booth, 1994). Clearly, an in-depth human factors analysis during accident investigations is a key in understanding how and why accidents occur. Once the how and why are identified, accident prevention strategies can be employed to prevent future accidents, which is the main objective of accident investigations.

G.   ACCIDENT REPORTING

Accident investigative procedures must culminate in a comprehensive, unbiased, factual based accident report (Goetsch, 1996). The goal of the accident report is to provide safety professionals and engineers with the information necessary to identify root

accident causal factors. Once these factors are identified, accident prevention strategies can be implemented to prevent future accident occurrence.

Safety professionals are faced with two primary tasks when producing accident reports. They must produce reports required by federal and state laws and provide reports useful to an effective safety program. Often these two requirements create a conflict of interest (NSC, 1975). Studies indicate accident-reporting systems are not producing factual information databases, but have grown into a relatively unplanned way to meet individual or organizational needs and preferences (Adams & Hartwell, 1977). Organizations must elicit unbiased databases conducive to the development of accident prevention strategies.

A difficult dilemma facing safety professionals is how long and detailed should an accident report be? On one hand an accident report must be quick and simple to prevent unnecessary work by those completing the forms. In contrast, the form must be detailed and long enough to provide all necessary facts surrounding the accident to be useful for formulating accident prevention strategies (Pimble & O'Toole, 1982).

Accident reports can take many forms, such as a checklist, questionnaire, or a narrative summary. Every organization presents a unique atmosphere of accident problems, therefore no single standard accident report form may solve the safety problems of each organization (NSC, 1975). Organizations must adopt a report format conducive to their work atmosphere. A common theme in the literature is that the forms being used by investigators are not capturing the ergonomics or human factors aspects of an accident event (Adams, Barlow, & Hiddlestone, 1981). Considering human factors

present in accident events has been estimated as high as 90 percent (Perrow, 1984), investigators must ensure these factors are captured in the accident report format.

In order to capture human factors aspects of an accident event, the accident form must be geared at determining the causes rather than describing the effects. Adams et al. (1981) and Edwards (1981) suggest that to accomplish this goal accident report forms should meet the criteria of a good questionnaire design since the writing skills of investigators may vary. In addition, Adams et al. (1981) suggests this questionnaire should produce information already categorized. In doing so "data which are categorical can be translated into meaningful statistical tables much more readily than can qualitative, descriptive data" and "if this categorization of data is carried out at the initial report stage, the intrusion of misinterpretation, ambiguity and consequent reduction of validity are all minimized" (p. 71). Clearly such an approach would produce unbiased, factual data useful for the analysis and design of accident prevention strategies, the main goal of an accident-reporting system.

H.   ACCIDENT ANALYSIS

Accident analysis techniques range from the simple tabulation of frequency or severity rates to a more sophisticated technique of task analysis, an in-depth analysis producing a step-by-step description of the work task performed. Regardless of the technique used, the goal of accident analysis is to identify specific causal factors of the accident so that corrective actions can be taken to preclude similar accidents from occurring (Drury & Brill, 1983). The major problem impeding this goal is that accident databases for analysis are generated by investigators outside the field of human factors, when in fact human factors have been found to be attributable to 90 percent of accidents

(Perrow, 1984; Shappell & Wiegmann, 1997b). As a result, few organizations generate corrective actions from the analysis of their accident database (Kletz, 1976).

Pimble and O'Toole (1982) cite a new Swedish system for collecting and analyzing occupational injuries. The system places much emphasis on accident prevention with the following goals: "(1) to initiate a local investigation of every accident; (2) to provide statistical services for individual companies, industrial inspectors, instructors, employers and employees organizations; and (3) to provide a report form suitable for both safety and insurance purposes" (p. 969). Investigating every accident is important since accidents, minor or major, provide valuable information for analysis. Reports and analysis suitable for both safety and insurance purposes is a formidable goal, since it accomplishes two objectives. Statistical services are a nice feature, however, as suggested by Blake (1963), reports and analysis are not useful if they just tell the story statistically. Analysis of accident reports must capture the "how" and "why" of an accident event.

Heinrich's domino theory of accident causation views an accident as a sequence of events. Drury and Brill (1983) observe that each job activity consists of a sequence of tasks and that accidents are the interaction between the individual, the task, the equipment, and the environment. Therefore, analyzing the human factors aspect of each task can identify the "how" and "why" of an accident sequence (Monteau, 1977). Drury and Brill (1983) assert that once these accident producing tasks are identified they can be grouped into hazard patterns or "scenarios", which are considered useful if:

1. A maximum of six scenarios accounts for more than 90 percent of the in-depth investigations.
2. Each scenario suggests at least one apparently feasible and effective intervention strategy appropriate only to that scenario.

3. Each scenario is mutually exclusive of all others, so that each in-depth investigation can be assigned logically to one and only one scenario.
4. Each scenario has human factors as a major parameter in its description (p. 335).

In summary, once these scenarios are identified, interventions can be aimed to reduce their occurrence.

Drury and Brill's (1983) concepts are successfully applied by Laughery, Petree, Schmidt, Schwartz, Walsh, and Imig (1983). Laughery et al. (1983) emphasize Blake's (1963) concept that analysis which tells the story statistically is of no use in capturing the "how" and "why" of an accident event. They assert statistical analyses, consisting of data tabulation, tend to be static and do not capture the dynamics of an accident event. Developing an accident scenario coding scheme consisting of four dynamic variables – prior activity, accident event, resulting event, and injury event – and two descriptor variables – agent of accident and source of injury – they code 1,874 industrial accidents. Once coded with this scheme, they are able to show that scenarios or patterns, consisting primarily of human factors, can be identified and interventions can be aimed at reducing their occurrence. In a similar analysis, Laughery and Schmidt (1984) use a similar scenario analysis coding scheme to analyze industrial back injuries. Their results indicate that 72 percent of the back injuries can be attributed to just one scenario – overexertion. Clearly, they suggest interventions can be focused on the design of the tasks and the limitations of the employees carrying them out.

I. NAVY OCCUPATIONAL AND SAFETY HEALTH PROGRAM

OSHA is directed towards the private sector employer, however, provisions of the Act required federal agencies to establish and maintain occupational safety and health programs. Although the Navy has conducted occupational safety and health standards for

many years, the Secretary of the Navy (SECNAV) issued policy statements and outlined responsibilities for the implementation of the total safety and occupational health program for the Navy (DON, 1997a). In addition to standard occupational safety and health, the total safety and occupational health program focuses on all safety disciplines, including system safety, aviation safety, weapons and explosives safety and off-duty safety (DON, 1997b). The primary document guiding the implementation of the program for all Navy commands, both shore and afloat, is OPNAVINST 5100.23C, "Navy Occupational Safety and Health (NAVOSH) Program Manual" (DON, 1997c). A tailored version of this manual for the operational fleet is OPNAVINST 5100.19C, "NAVOSH Program Manual for Forces Afloat" (DON, 1997a).

OPNAVINST 5100.19C provides guidance for the implementation of the NAVOSH program onboard all U.S. Navy surface ships and submarines, including U.S. Naval Ships (USNS) of the Military Sealift Command (MSC). This manual is broken down into four sections: (1) NAVOSH Program; (2) Major Hazard – Specific Programs; (3) Surface Ship Safety Standards; and (4) Submarine Safety Standards. In addition, the manual provides checklists for the self-evaluation of a unit's overall NAVOSH Program and major hazard-specific programs.

Section one, NAVOSH Program, provides an overview of the NAVOSH Program organization and delineates responsibilities from the Chief of Naval Operations (CNO) to Fleet Commanders on down to individual afloat units. They key is the requirement for every Navy unit to designate a safety officer responsible for the implementation and enforcement of the NAVOSH program. Guidelines are established for inspections and surveys conducted by an outside agency in order to evaluate an individual unit's

compliance to NAVOSH standards. Mishap investigation and reporting procedures are provided to capture the dynamics of an accident event for collection, analysis, and dissemination by NAVSAFECEN. In addition, training requirements are set forth since the basis of any safety program is continuous, effective all hands training and participation.

Section two, Major Hazard – Specific Programs, addresses specific hazards such as hearing conservation, heat stress, respiratory protection, electrical safety, and hazardous material control as well as personnel protective equipment (PPE). The intent is similar to OSHA standards, certain hazard areas present a greater risk to personnel and, therefore, more specific safety guidelines can assist supervisors and personnel in preventing accidents in these areas. The guidance here provides key shipboard personnel, such as the Safety Officer, Electrical Safety Officer, Hazardous Material Coordinator, and Medical Department representatives, with the information necessary to manage and implement effective occupational safety and health standards in their specific hazard area.

Sections three and four, Surface Ship Safety Standards and Submarine Safety Standards respectively, provide safety guidelines specific to their individual environments. Though two distinct and unique environments, a common theme is found in both as described by the DON (1997a):

> Shipboard life is one of the more hazardous working and living environments that exist. The existence of hazardous materials and equipment, in addition to the fact that a ship is a constantly moving platform subject to conditions such as weather, collision, and grounding contribute to an accident prone environment. Any chain of mishaps could lead to a major catastrophe. It is for this reason, PRACTICAL SAFETY must be followed and the prescribed safety regulations strictly followed to prevent personal injury and illness. (p. C1-1, p. D1-1)

Clearly, the working environment onboard surface ships and submarines provides additional factors private sector employers do not face, such as weather conditions and a lack of outside activity support when at sea. What may be considered a minor mishap in the private sector can lead to the complete loss of a shipboard vessel and her crew. For this reason, specific safety guidelines are provided for the safe and effective operation of naval ships and submarines.

J.   ELECTRICAL HAZARDS AND SAFETY

Chapter 300 of the Naval Ships' Technical Manual concerning general electrical plant safety precautions states:

> ELECTRIC SHOCK.   Safety precautions must always be observed by persons working around energized electric circuits and equipment.   Injury may result from electric shock.   Short circuits can be caused by accidentally placing or dropping a metal tool, flashlight case, or other conducting article across an energized line. These short circuits can cause an arc or fire on even relatively low voltage circuits, and may result in extensive damage to equipment and serious injury to personnel. (Naval Sea Systems Command, 1997, p. 2-1)

An electrical shock injury is caused by the flow of electrical current through the body. Current flow is measured in amperes (amps) and the severity of an electrical shock injury is reflective of the amount of current flow: (1) 0.001 amps and a shock is felt; (2) 0.01 amps and a person may be unable to let go; (3) 0.1 amps and a shock may be fatal if it lasts for one second or more (DON, 1996).   Understanding the hazards of electrical current is the key to preventing personnel injury.

Goetsch (1996) provides an excellent description of current flow. For current to flow, the path of electrical current must make a complete loop. Elements of this loop include the source of electrical power, a conductor (conducive to electrical flow) to act as the path, an electrical device to use the current, and a path to the ground. When an

individual makes contact with a conductor carrying a current and contacts the ground or another object that provides a conducive path to the ground, electrical shock can occur. The individual completes the circuit loop and the current passes through his or her body.

The key to understanding the effects of current flow is Ohm's law: $V=IR$. V is the potential difference in volts, I is the current flow in amps and R is the resistance to current flow in ohms. Typical electrical systems are 110 volts. Human resistance to electrical current is normally 100,000 ohms for dry skin, 1,000 ohms for wet skin, 400 to 600 ohms for the internal body (hand to foot), and about 100 ohms from ear to ear (McElroy, 1974). Using Ohm's law and performing the math indicates the human body is an excellent conductor of electricity (e.g. $V=110$ volts and $R=600$ ohms due to hand contact with an electrical current, $I=V/R$ and the individual is exposed to 0.183 amps, more than enough to cause fatal injury). Therefore, the higher the resistance, the lower the current flow, and the probability of electrical shock is reduced. Thus electrical shock injuries can be prevented by insulating the conductors (insulators such as rubber gloves are not conducive to current flow), insulating the people, or isolating the electrical equipment from the people (Goetsch, 1996).

Despite the fatal hazards associated with electrical current, electrical injuries continue to occur in the work environment. Common causes of electrical shock include contact with a bare wire carrying current, working on electrical equipment in which the power is not secured, working on electrical equipment in a damp or wet environment, working on electrical equipment without PPE, or working on electrical equipment that has not been properly grounded. Electrical systems onboard a naval vessel tend to create more of a hazard to personnel since these systems are ungrounded as compared to

grounded systems in an industrial environment ashore (Naval Sea Systems Command, 1997).

In simple terms, a grounded system provides a conducting path between the equipment and the earth, providing less of a hazard to personnel. Personnel onboard ship do not have this luxury since the electrical systems onboard ship are ungrounded systems. When an individual comes in contact with a live conductor of an electrical system onboard ship it has the capacitance to ground to the ships hull. The individual provides the missing link of the loop for current flow and the current flows through the individual to the hull resulting in an electrical shock (DON, 1996).

The attributes of a shipboard environment create significant electrical hazards. Practically every piece of equipment onboard ship requires electrical power, such as radars to navigate, weapons systems for defense, communication gear, portable tools, personal equipment, and lighting. The combination of high humidity, metal structures, high voltage electricity, perspiration, and seawater enhance typical electrical hazards found ashore. For these reasons, the Navy considers electrical safety an all hands responsibility (DON, 1997a).

All U.S. Navy ships and submarines maintain an electrical safety program in accordance with U.S. Navy regulations. This program includes semi-annual electrical training required for all personnel, a portable tool issue room, control and safety testing of all personal electrical and electronic equipment, specific electrical equipment tag-out procedures, and PPE. In addition, the electrical safety program contains a checklist of requirements for continued self-evaluation and inspections. Due to the uniqueness of a

shipboard environment, 100 percent compliance by all personnel is mandatory to prevent fatal electrical hazards (DON, 1997a).

K.   SUMMARY

Prior to the 20th century, practically no legislation existed promoting safety and health for employees. The 20th century saw the birth of the Safety Movement and the single most important piece of legislation promoting safety and health, the OSHA Act. Employers, including the U.S. Navy, faced with moral, legal, and economical obligations, have undertaken safety programs to prevent accidents. In an attempt to prevent accidents the root causes must be identified. With this in mind numerous theories of accident causation have been formed and they primarily center on the human element.

Estimates of human causal factors attributable to accidents have ranged as high as 90 percent. Accident investigating, reporting, and analysis techniques indicate accident databases are not conducive to human factors analysis. Recent studies investigating and analyzing accidents through task and scenario analysis indicate root human causal factors of accident occurrence can be identified. Once identified, interventions aimed at these hazard patterns or scenarios can lead to effective accident prevention programs.

Of particular interest in this study are electrical hazards and safety in a shipboard environment. Understanding the hazards associated with electrical equipment is the key to preventing personnel injury. Human factors related interventions such as tagout of equipment and PPE assist in preventing electrically related mishaps to personnel. Identifying failed interventions and maintaining a quality electrical safety training and awareness program is the key to preventing fatal electrical injuries to personnel in a shipboard environment.

III. METHODOLOGY

A.   RESEARCH APPROACH

This study is based on the existing database of SCM Reports maintained by NAVSAFECEN. The SCM Reports selected contain data relating to electrical shock occurrence onboard surface ships. A human factors analysis is conducted to identify salient patterns present in the data that might be used to predict the estimated number of future electrical shock mishaps. A stochastic model of electrical shock mishap occurrence is constructed, potential intervention strategies are identified for the human factors components found, and are evaluated using the model. In particular, the stochastic model is used to evaluate estimated future mishap frequencies and associated costs.

B.   DATABASE

NAVSAFECEN maintains a database of all reported occupational and operational mishaps occurring to Navy and Marine Corps personnel. Each electrical shock SCM Report received by NAVSAFECEN is entered by hand into the Safety Information Management System (SIMS) database. The SIMS database is queried for all incidents of electrical shock occurring onboard U.S. Navy surface ships to both active duty, TAR, and reservist personnel in the U.S. Navy and U.S. Marine Corps between 1 January 1995 and 31 December 1997. A total of 897 reports involving 927 cases of electrical shock are obtained.

C.   SPECIAL CASE MISHAP (SCM) REPORTS

SCM Reports are submitted to NAVSAFECEN by the mishap unit via message traffic or a written report in accordance with OPNAVINST 5100.19C (DON, 1997a).

They contain a brief narrative of the mishap, demographic information of the mishap victim and mishap unit, and identifiable contributing mishap cause factors. There is a wide range in the quality of inputs provided by the mishap units. Appendix A provides an example of a SCM.

D.   PROCEDURE

On-line queries of NAVSAFECEN's database containing SCM Reports for electrical shock incidents are provided in ASCII text format. The ASCII text is converted to Microsoft Word 97 format and all unnecessary headers and repetitive fields are deleted in order to condense the reports. Electrical shock mishap data is extracted from the condensed SCM Reports and entered into a Microsoft Excel 97 spreadsheet. The spreadsheet consists of rows of electrical shock mishaps and columns of descriptive statistics and categorical data. Electrical shock mishaps involving more than one person are classified as a single mishap, however one row is used for each person injured in the mishap. The columns consisted of the date and time of occurrence, mishap classification, ship type, ship status (inport/underway), evolution ship involved in, fleet ship assigned, age, sex, rating or rank, task performing, and task experience of the victim, cost of the injury, victim's work days lost, days hospitalized, and restricted activity work days, general cause factor, and a brief summary of the event.

E.   DATA ANALYSIS

Electrical shock mishaps are classified using an abridged form of scenario analysis, and salient human factors patterns are identified through data tabulation. Data is fit to a stochastic model to identify the electrical shock mishap arrival process. In particular, a Poisson process model is used since it has proved successful in previous

studies (e.g. Schmorrow, 1998). The model includes both mishaps that involve human factors and those that do not involve human factors. A Compound Poisson process is used to estimate the number of personnel shocked when a mishap event occurs, in addition to the costs associated with the event. Potential intervention strategies are identified from failed human factors interventions and subsequently evaluated using the electrical shock mishap model developed to determine their potential impact on future mishap frequencies and associated costs.

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IV. RESULTS

A. BACKGROUND

The average number of electrical shock mishaps occurring onboard U.S. Navy surface ships exhibits a general increase from CY90 - CY97. Figure 1 depicts the average number of electrical shock mishaps per surface ship for CY90 through CY97 and Figure 2 depicts the average number per 1,000 personnel assigned to those ships. The average number of electrical shock mishaps per surface ship averages 0.92 for CY90 – CY94 and 1.17 for CY95 - CY97, whereas the average number per 1,000 personnel assigned to those ships averages 2.10 for CY90 - CY94 and 2.65 for CY95 – CY97.
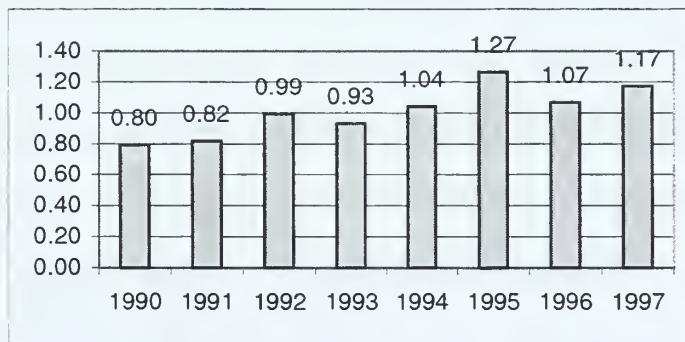
Figure 1. Average Number of Electrical Shock Mishaps per Surface Ship by Year
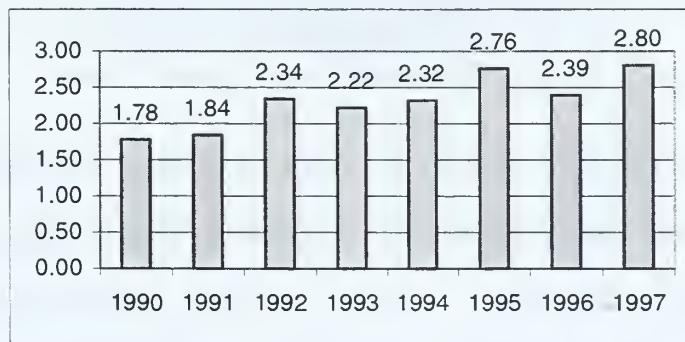
Figure 2. Average Number of Electrical Shock Mishaps per 1,000 Personnel by Year

Prior to 1995 major draw-downs and budget constraints result in a significant decrease in the number of surface ships and the personnel assigned to those ships each

year. In January 1994 there are 292 surface ships and 128,097 personnel assigned to those ships and by December 1994 there are 265 surface ships and 120,975 personnel, a decrease of 27 ships and 7,122 personnel in just one year. Over a three year period, from January 1995 until December 1997, the number of surface ships and personnel decreases by only 3 ships and 16,395 personnel. With an increasing trend in electrical shock mishaps and a relatively stable force structure, CY95 - CY97 represents a robust data set for root cause identification of electrical shock occurrence.

B.   DATA EXPLORATION

Between 1 January 1995 and 31 December 1997 there are a total of 897 reported electrical shock mishap events resulting in 927 personnel receiving an electrical shock. Clearly, the majority of the events involve a single individual receiving an electrical shock (92.32%), however some events result in as many as four individuals receiving a shock. The total number of events and shocks are summarized in Table 1.

# Personnel	1995	1996	1997	Totals	Percent
1	311	272	290	873	97.32%
2	8	6	6	20	2.23%
3	1	0	1	2	0.22%
4	1	0	1	2	0.22%
Total Events	321	278	298	897	100.00%
Total Shocks	334	284	309	927	

Table 1. Electrical Shock Mishap Events

The Navy classifies mishaps according to accident severity depending on the dollar value reached and/or involvement of personnel fatalities/injuries (see definitions page 6). Mishap severity includes: 1 Class A (0.11%), 3 Class B (0.32%), 61 Class C (6.58%), and 862 Class D (92.99%). It should be noted the only Class A electrical shock mishap involves a fatality. In addition, most of the mishaps are less than Class C in severity. Table 2 provides a summary of mishap severity.

Severity	1995	1996	1997	Totals	Percent
Class A	1	0	0	1	0.11%
Class B	0	0	3	3	0.32%
Class C	29	20	12	61	6.58%
Class D	304	264	294	862	92.99%
Totals	334	284	309	927	100.00%

Table 2. Electrical Shock Mishap Severity

Ship type can be divided into five categories: Carriers, Combatants, Amphibs, Auxiliaries, and Other. Out of the 927 electrical shock mishaps, "Carriers" account for 299 (32%) of the mishaps. "Combatants" (cruisers, destroyers, and frigates) account for 297 (32%) of the mishaps. The remaining distribution of mishap ships are as follows: 155 (17%) on "Amphibs" (helicopter, equipment, and troop transport ships), 133 (14%) on "Auxiliaries" (oilers, ammunition ships, and repair ships), and 43 (5%) on "Other" (patrol craft, mine counter-measure, diving ships, and unknowns). Carriers, with the largest crew of any naval vessel, account for a majority of the mishaps. A classification of the electrical shock mishap data by ship type is provided in Figure 3.
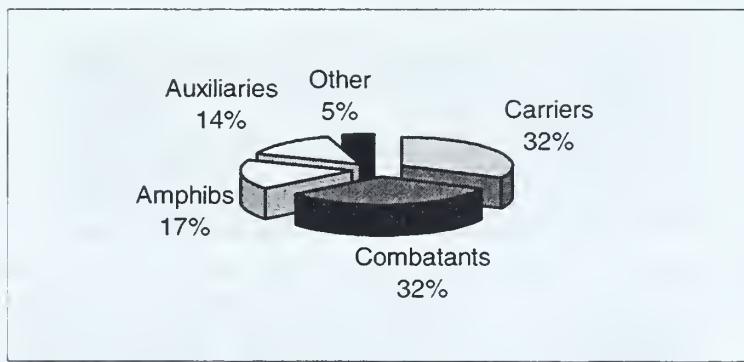
Figure 3. Electrical Shock Mishaps by Ship Type

Data extracted specific to a "mishap ship" includes the fleet to which the ship is assigned, the location of the ship at the time of the mishap, and the evolution the ship is involved in when the mishap occurred. Out of the 927 electrical shock mishaps, Commander In Chief, U.S. Atlantic Fleet (CINCLANTFLT) is responsible for 523

(56.42%) of the mishap ships and Commander In Chief, U.S. Pacific Fleet (CINCPACFLT) is responsible for the remaining 404 (43.58%). When the mishaps occur, 401 (43.26%) are underway (at sea), 387 (41.75%) are inport, 121 (13.05%) are in a shipyard, and the remaining 18 (1.94%) are at anchor or in a dry-dock. Evolutions of the mishap ships include 417 (44.98%) involved in upkeep (maintenance), 350 (37.76%) involved in independent steaming operations, 99 (10.68%) conducting an overhaul in the shipyards, 43 (4.64%) conducting flight operations, and the remaining 18 (1.94%) are involved in other evolutions (underway replenishment operations, sea and anchor detail, or conversion prior to commissioning). The Atlantic Fleet accounts for slightly more of the mishaps, there is an insignificant difference between a mishap occurring underway or inport, and a majority of the mishaps occur during upkeep or independent steaming operations. A tabulation of the fleet to which a ship is assigned, the location of the ship at the time of the mishap, and the evolution the ship is involved in when the mishap occurred is provided in Tables 3, 4, and 5.

Fleet	1995	1996	1997	Totals	Percent
Atlantic	188	156	179	523	56.42%
Pacific	146	128	130	404	43.58%
Totals	334	284	309	927	100.00%

Table 3. Electrical Shock Mishaps by Fleet

Location	1995	1996	1997	Totals	Percent
Underway	137	119	145	401	43.26%
Inport	150	118	119	387	41.75%
Yards	44	37	40	121	13.05%
Anchor/Dry-dock	3	10	5	18	1.94%
Totals	334	284	309	927	100.00%

Table 4. Electrical Shock Mishap Ship Locations

Evolution	1995	1996	1997	Totals	Percent
Upkeep	159	132	126	417	44.98%
ISE	125	99	126	350	37.76%
Overhaul	36	32	31	99	10.68%
Flight Ops	8	18	17	43	4.64%
Other	6	3	9	18	1.94%
Totals	334	284	309	927	100.00%

Table 5. Electrical Shock Mishap Ship Evolutions

Table 6 provides a tabulation of an electrical shock mishap victim's service and duty status: active duty, TAR, and reservist personnel in both the Navy and Marine Corps. Active duty Navy personnel account for 911 (98.27%) of the mishaps; the remaining 16 (1.73%) are composed of Navy TAR, Navy reservist, and active duty Marine Corps personnel. Since the majority of a ship's crew is active duty Navy personnel, they account for most of the mishaps. Similarly, prior to 1997, few females were assigned to surface combatants. Thus, as seen in Table 7, males account for 874 (94.28%) of the victims, whereas females only account for the remaining 53 (5.72%). Table 7 provides a tabulation of mishap victims by gender.

Service/Status	1995	1996	1997	Totals	Percent
Navy Active	327	279	305	911	98.27%
Navy TAR	6	2	2	10	1.08%
Navy Reserve	0	0	1	1	0.11%
Marine Active	1	3	1	5	0.54%
Total Shocks	334	284	309	927	100.00%

Table 6. Electrical Shock Mishap Victims by Service and Status

Gender	1995	1996	1997	Totals	Percent
Male	312	269	293	874	94.28%
Female	22	15	16	53	5.72%
Totals	334	284	309	927	100.00%

Table 7. Electrical Shock Mishap Victims by Gender

A tabulation of mishap victims by rate and rank is given in Table 8 and depicted in Figure 4. E3's through E5's, who conduct a majority of the maintenance onboard

surface ships, account for most of the mishaps (76.27%). Note the distinctive pattern amongst the E1's through E7's, who account for 96 percent of the mishap victims. With the exception of E8's through O5's, the data appears symmetrically distributed amongst E1's through E7's with a mode at E4's. The average age of an electrical shock mishap victim is 24 years old, roughly the average age of an E4 in the Navy.

Rate/Rank	1995	1996	1997	Totals	Percent
E1	5	10	6	21	2.27%
E2	26	21	25	72	7.77%
E3	73	63	62	198	21.36%
E4	114	104	102	320	34.52%
E5	72	53	64	189	20.39%
E6	25	21	26	72	7.77%
E7	9	4	6	19	2.05%
E8-O5	10	8	18	36	3.88%
Totals	334	284	309	927	100.00%

Table 8. Electrical Shock Mishap Victims by Rate/Rank
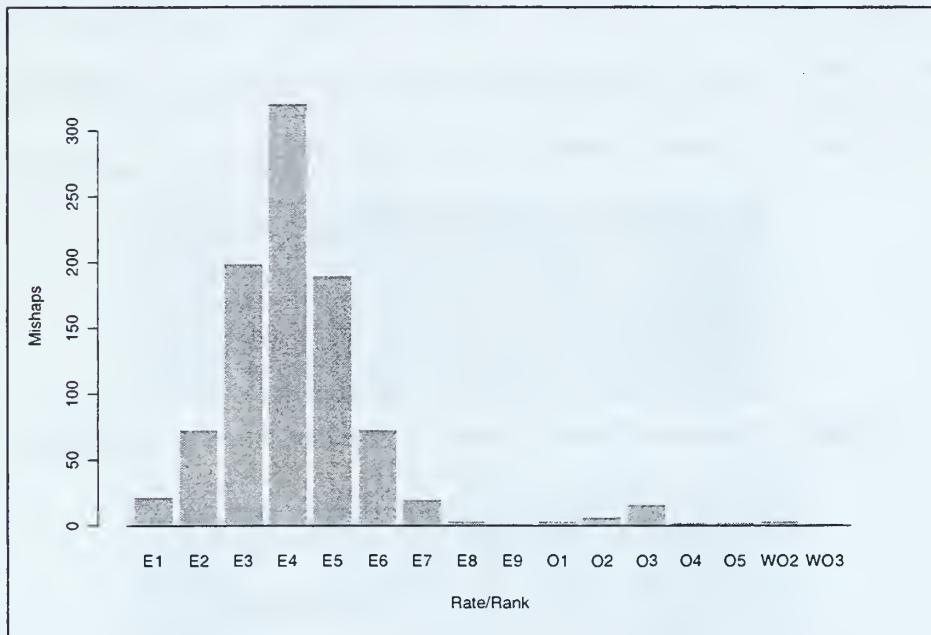
Figure 4. Histogram of Electrical Shock Mishap Victims by Rate/Rank

Table 9 provides a tabulation of electrical shock mishap victims by rating and rank. Electrical shock mishaps involve 58 different Navy enlisted ratings and 14 of those

ratings account for 564 (60.84%) of the mishaps (EM, AT, MM, ET, MS, HT, BM, EN, IC, OS, FC, RM, DC, and AE). The remaining 44 Navy enlisted ratings account for 208 (22.44%), undesignated enlisted Navy personnel (Seaman, Fireman, and Airman) account for 118 (12.73%), Navy officers account for 32 (3.45%), and Marine enlisted personnel account for the remaining 5 (0.54%) of the mishaps. The Navy's "electrical ratings", EM, AT, and ET are 3 of the top 4 ratings involved in the mishaps.

Rating	1995	1996	1997	Totals	Percent
Electrician's Mate (EM)	31	26	27	84	9.06%
Aviation Electronics Technician (AT)	24	19	23	66	7.12%
Machinist's Mate (MM)	14	20	22	56	6.04%
Electronic's Technician (ET)	26	13	15	54	5.83%
Mess Management Specialist (MS)	15	13	19	47	5.07%
Hull Maintenance Technician (HT)	9	14	17	40	4.31%
Boatswain's Mate (BM)	14	12	10	36	3.88%
Engineman (EN)	16	6	13	35	3.78%
Interior Communications Electrician (IC)	15	9	5	29	3.13%
Operations Specialist (OS)	11	12	6	29	3.13%
Fire Controlman (FC)	11	7	6	24	2.59%
Radioman (RM)	5	5	13	23	2.48%
Damage Controlman (DC)	4	7	10	21	2.27%
Aviation Electronics Mate (Ae)	10	4	6	20	2.16%
Subtotal				564	60.84%
44 Other Ratings	70	68	70	208	22.44%
Seaman/Fireman/Airman	50	40	28	118	12.73%
Navy Officer	8	6	18	32	3.45%
Marine Enlisted	1	3	1	5	0.54%
Totals	334	284	309	927	100.00%

Table 9. Electrical Shock Mishap Victims by Rating/Rank

In order to estimate personnel injury costs, total number of days hospitalized and lost and/or restricted work days are tabulated by year (Table 10). In addition, Table 10 gives the number of fatalities (FAT), permanent total disabilities (PTD), or permanent partial disabilities (PPD) occurring in each year. The tabulation of injury costs are as follows: 76 mishap victims (8.20%) involve enlisted personnel, which account for all total days hospitalized (53), all lost work days (147), and all days restricted in work

activity (248). One enlisted mishap victim is a FAT and one enlisted victim involves a PPD. The remaining 849 mishap victims involve no lost time case injuries. (note: the DOD cost standard table is provided in Appendix C with a justification of cost estimation techniques used for this analysis)

CY95$	1995	1996	1997	Totals	Rate	Cost
Restricted Activity Days	212	11	25	248	$230	$57,040
Lost Work Days	83	25	39	147	$460	$67,620
Hospitalized Days	44	4	5	53	$571	$30,263
Permanent Partial Disability	0	0	1	1	$141,024	$141,024
Fatality	1	0	0	1	$153,286	$153,286
No Lost Time Case Injuries	297	262	290	849	$147	$124,803
Total Injury Cost	$309,009	$54,828	$210,199			$574,036

Table 10. Electrical Shock Mishap Victim Injury Severity and Costs

C.   HUMAN FACTORS ANALYSIS

A human factors contribution to an accident is contended to consist of an individual's decisions, actions, or inactions which are linked to a chain of events that lead to it (Raby & McCallum, 1997). Of the 927 electrical shock mishaps in CY95 – CY97, 794 (85.65%) are human factors related. The remaining 133 (14.35%) mishaps are classified as being either a material, environmental, or of unknown cause. Clearly, the human element accounts for most of the events. Table 11 provides a summary of electrical shock mishap causal factors.

Cause	1995	1996	1997	Totals	Percent
Human Factors	282	248	264	794	85.65%
Material	44	30	32	106	11.43%
Unknown	7	6	11	24	2.59%
Environmental	1	0	2	3	0.32%
Totals	334	284	309	927	100.00%

Table 11. Electrical Shock Mishaps by Causal Factors

Electrical shock mishap victims are primarily engaged in six prior activities before a mishap occurs. These six activities account for 831 (89.64%) of the mishaps. They are:

1. Maintenance (33.55%) – activity involving corrective maintenance
2. Watch (18.77%) – activity carried out in the performance of watchstanding duties
3. Troubleshooting (14.67%) – activity involving the investigation of apparent discrepancies
4. Housekeeping (9.82%) – activity involving cleaning or field day
5. "PMS" - Planned Maintenance System (8.85%) – activity involving scheduled preventive maintenance
6. Welding (3.99%) – activity involving the uniting of metallic parts by heating

Eight other activities (inspection, space rehabilitation, food preparation, damage control, training, sanding/grinding, dishwashing, and laundry services) account for the remaining 96 (10.36%) of the mishaps. The majority of activities involve personnel working on equipment which is supplied electrical power and have known associated electrical shock hazards. A mishap victim has an average of 31.22 months experience with the task he or she is performing. Table 12 provides a summary of the electrical shock mishap victim's prior activity.

Prior Activity	Total	Percent	Prior Activity	Total	Percent
Maintenance	311	33.55%	Space Rehabilitation	20	2.16%
Watch	174	18.77%	Food Preparation	17	1.83%
Troubleshooting	136	14.67%	Damage Control	14	1.51%
Housekeeping	91	9.82%	Training	14	1.51%
PMS	82	8.85%	Sanding/Grinding	6	0.65%
Welding	37	3.99%	Dishwashing	4	0.43%
Inspection	20	2.16%	Laundry Services	1	0.11%
			Totals	927	100.00%

Table 12. Electrical Shock Mishaps by Victim's Prior Activity

The safety literature indicates two primary human factors orientated electrical shock hazard interventions are associated with equipment which is supplied electrical power, they are proper tagout of equipment and use of personal protective equipment

(PPE). Tagout of equipment and PPE are not mutually exclusive and therefore a mishap can be a combination of the two. Tagout of equipment, PPE, or a combination account for 343 (37.00%) of the 927 electrical shock mishaps. The tabulation of failed human factors orientated interventions of the 927 electrical shock mishaps is presented in Table 13.

Intervention	1995	1996	1997	Totals	Percent
Tagout	58	39	63	160	17.26%
PPE	48	41	45	134	14.46%
Both	19	5	25	49	5.29%
Totals				343	37.00%

Table 13. Failed Human Factors Electrical Shock Interventions

Cross tabulating primary prior activity with failed human factors interventions depicts a pattern which shows how much electrical shock mishaps can be reduced for each activity had the victim properly tagged out equipment, worn PPE, or properly performed a combination of both. The prior activities of maintenance and troubleshooting involve a majority of the failed interventions. The cross tabulation of primary prior activity with failed human factors interventions is presented in Table 14.

Prior Activity	# Activities	Tagout	PPE	Both	Total	Percent
Maintenance	311	63	41	17	121	13.05%
Watch	174	9	1	2	12	1.29%
Troubleshooting	136	42	29	16	87	9.39%
Housekeeping	91	14	8	2	24	2.59%
PMS	82	20	14	8	42	4.53%
Welding	37	0	30	0	30	3.24%
Other	96	12	11	4	27	2.91%
Totals	927				343	37.00%

Table 14. Cross Tabulation of Prior Activity with Failed Interventions

Of the 794 human factors related electrical shock mishaps, the remaining 451 are attributable to the victim's decisions, actions, and inactions (34.00%) or to other individual's decisions, actions, and inactions (14.70%). Victim's decisions, actions, and

inactions consist primarily of inattentiveness, complacency, violations, and an array of procedural errors. They are presented in Table 15. Other individual's decisions, actions, and inactions consist of procedural errors, inattentiveness, complacency, violations, and a combination of design problems and a lack of PMS and equipment procedural instructions. They are presented in Table 16. The majority of these mishaps are the result of the mishap victim's inattentiveness, complacency, or commission of electrical safety violations.

Mishap Victim Decisions/Actions/Inactions	Total	Percent
Inattentiveness/Complacency/Violations	199	21.47%
Procedural errors	22	2.37%
Failure to use shorting probe/discharge capacitors	24	2.59%
Failure to safety check equipment/extension cords	27	2.91%
Failure to ground test equipment/equipment	13	1.40%
Investigating cause of shock/electrical discrepancy vice reporting	11	1.19%
Plugging/Unplugging power on	11	1.19%
Operating equipment not qualified for	3	0.32%
Cutting electrical cable while sanding/grinding	2	0.22%
Failure to use insulated tools	3	0.32%
Totals	315	33.98%

Table 15. Mishap Victim Decisions, Actions, and Inactions

Other Individual Decisions/Actions/Inactions	Total	Percent
Improperly installed (includes not grounded) equipment/junction box	33	3.56%
Inattentiveness/Complacency/Violations	28	3.02%
Improperly routed/damaged welding cable/electrical cable	22	2.37%
Inadequate design/PMS coverage/Procedural coverage	22	2.37%
Improperly dead-ended electrical cable	19	2.05%
Cutting electrical cable while sanding/grinding	4	0.43%
Plugging/Unplugging power on	3	0.32%
Improperly repaired equipment	2	0.22%
Failure to safety check equipment	2	0.22%
Failure to discharge capacitors	1	0.11%
Totals	136	14.67%

Table 16. Other Individual Decisions, Actions, and Inactions

To summarize the general findings, analysis of the mishap reports identifies that human factors attributable to electrical shock mishaps can be categorized into five categories: tagout of equipment, PPE, a combination of both, mishap victim's decisions,

actions, and inactions, and other individual's decisions, actions, and inactions. Non-human factors – material, environmental, unknown causes – attribute to the remaining mishaps. Table 17 provides a summary of human factors and non-human factors attributable to the 927 electrical shock mishaps.

Causes					
Human Factors	1995	1996	1997	Total	Percent
Tagout	58	39	63	160	17.26%
PPE	48	41	45	134	14.46%
Tagout/PPE	19	5	25	49	5.29%
Victim's Decisions/Actions/Inactions	110	107	98	315	33.98%
Other's Decisions/Actions/Inactions	47	56	33	136	14.67%
Subtotal	282	248	264	794	85.65%
Non-Human Factors	1995	1996	1997	Total	Percent
Material	44	30	32	106	11.43%
Unknown	7	6	11	24	2.59%
Environmental	1	0	2	3	0.32%
Subtotal	52	36	45	133	14.35%
Totals	334	284	309	927	100.00%

Table 17. Electrical Shock Mishaps by Human/Non-Human Factors

D.   STOCHASTIC MODELING

Gaver (1996) stated:

Models are not supposed to be perfect representations of the data sets to which they are fitted, but to represent the situation of concern well enough to be useful. (p.3).

Stochastic modeling is used to model the status quo of electrical shock mishap occurrence in order to predict the expected number of mishap events and associated costs in the near future. More importantly, the model will provide an estimate of the variability of these quantities over the next several years. The CY95 - CY96 data is used to formulate the initial model and the CY97 data is used for model verification. Appendix D provides a summary of overall electrical shock mishap events by month.

An approach that has proved successful in prior mishap studies (e.g. Schmorrow, 1998) is to model the number of electrical shock mishap events that occur monthly as a

Poisson Process with rate λ, where λ is the expected number of mishap events per month. A consequence of this model is that the number of events each month are then independently identically distributed Poisson random variables with an expected value of λ. The 618 electrical shocks occurring in CY95 - CY96 were the result of 599 mishap events. A chi-square goodness of fit test is used to determine whether or not the monthly occurrences of electrical shock mishap events in CY95 - CY96 can be reasonably modeled by a Poisson distribution. At a five percent level of significance, there was not enough evidence to reject the null hypothesis that the electrical shock mishap model followed a Poisson distribution (the chi-square test statistic is 4.53 with 6 degrees of freedom giving a p-value of 0.61). Therefore, the Poisson process model is suitable for predicting the occurrence of electrical shock mishap events.

The Poisson process model is tested to determine if it adequately predicts new data using the CY97 data (see Appendix D) not used in the initial model. At a five percent level of significance, cross validation demonstrates that the Poisson process model is valid for predicting future electrical shock mishap events (the chi-square test statistic is 3.29 with 6 degrees of freedom giving a p-value of 0.77).

Further, it is modeled that each time an electrical shock mishap event occurs it can be classified as a human factors event with probability p or a non-human factors event with probability [1–p], independent of all other events. Under this model, the number of human factors related mishap events is a Poisson process with rate λp and the number of non-human factors related mishap events is also a Poisson process with rate $\lambda[1-p]$ (Ross, 1997). From the CY95 - CY96 data the estimated monthly mishap event

rate is $\hat{\lambda} = 24.96$ mishap events per month, with an estimated probability of a human factors related event $\hat{p} = 0.855$ (initial cause of 512 out of 599 mishap events).

In addition, to check that the probabilities p (human factors related event) and [1-p] (non-human factors related event) remain constant for CY95 – CY96 and CY97, a 2x2 contingency table test is conducted. From the test, there is no evidence to indicate that the probability of a human factors related mishap event changes in CY97 (the chi-square test statistic is 0.009 with 1 degree of freedom giving a p-value of 0.92).

E.   FUTURE PREDICTIONS AND ASSOCIATED COSTS

Let N(t) be the number of mishap events occurring in [0,t], where t is measured in months. The expected number of electrical shock mishap events E[N(t)] is estimated by 24.96t using the Poisson process model from the previous section. In addition, the number of personnel receiving an electrical shock in [0,t], X(t), as a result of those events is modeled. Let Y_i be the number of personnel receiving an electrical shock as a result of a mishap event i, where i = 1, 2, …, 599. Assuming Y_1, Y_2, …, Y_{599} are independent and identically distributed, {X(t), t ≥ 0} is a Compound Poisson process, where

$$X(t) \quad = \quad \sum_{i=1}^{N(t)} Y_i .$$

The expected value, variance, and standard deviation of X(t) are calculated as follows (Ross, 1997):

$$E[X(t)] \quad = \quad \lambda t E[Y_1]$$

$$Var[X(t)] \quad = \quad \lambda t E[Y_1^2]$$

$$StdDev \quad = \quad \sqrt{Var[X(t)]}.$$

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Table 18 gives the estimated expected number of electrical shock mishap events and personnel shocks for t = 12, 24, 36, 48, and 60 months. Since 97 percent of the mishap events involve only one individual receiving an electrical shock the variance and standard deviation are negligible.

Months (t)	Estimated Expected Mishap Events	Estimated Personnel Shocks
12	299.52	309.10
24	599.04	618.21
36	898.56	927.31
48	1198.08	1236.42
60	1497.60	1545.52

Table 18. Estimated Expected Number of Electrical Shock Mishap Events/Shocks

Expected future costs associated with electrical shock mishap events can be estimated similarly. Let the total cost of personnel receiving an electrical shock in [0,t] be denoted by C(t). Let Z_i be the cost of electrical shocks as a result of a mishap event i, where i = 1, 2, ..., 599. Assuming Z_1, Z_2, ..., Z_{599} are independent and identically distributed, {C(t), t ≥ 0} is a Compound Poisson process, where

$$C(t) \quad = \quad \sum_{i=1}^{N(t)} Z_i .$$

As before, the expected value, variance, and standard deviation of C(t) are:

$$E[C(t)] \quad = \quad \lambda t E[Z_1]$$

$$Var[C(t)] \quad = \quad \lambda t E[Z_1^2]$$

$$StdDev \quad = \quad \sqrt{Var[C(t)]}$$

Initially calculations yielded an estimated expected cost of $607.41 (CY95$) per electrical shock mishap event with an estimated standard deviation of $6,871.09 (CY95$). The expected value and standard deviation do not give a complete picture of the distribution of costs. For example, of the 599 mishap events, 574 (95.83%) involved

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cost less than $1,000 (CY95$) and the remaining 25 (4.17%) events involved costs between $1,000 and $153,286 (CY95$). Thus, to get a more complete picture, the distribution C(t) is simulated by developing a function in the statistical software package S-Plus® (1998). The function generates 1000 annual costs based on first generating the number of electrical shock mishap events occurring in a year, $N(12)$ from a Poisson ($\lambda = 24.96$) distribution. $N(12)$ costs are then generated (one for each event occurring in the year) based on a simple random sample from the empirical distribution of costs from CY95 – CY96 cost data. An estimated expected annual cost of $182,459 (CY95$) with a standard deviation of $118,539 (CY95$) is generated. This average annual cost provides for reasonable future cost estimations based on historical data (note the actual cost of CY97 mishap events is $210,199 (CY95$)). The standard deviation can be attributed to events involving fatalities or disabilities. A histogram of the distribution of costs is presented in Figure 5. A copy of the computer program function can be found in Appendix D.
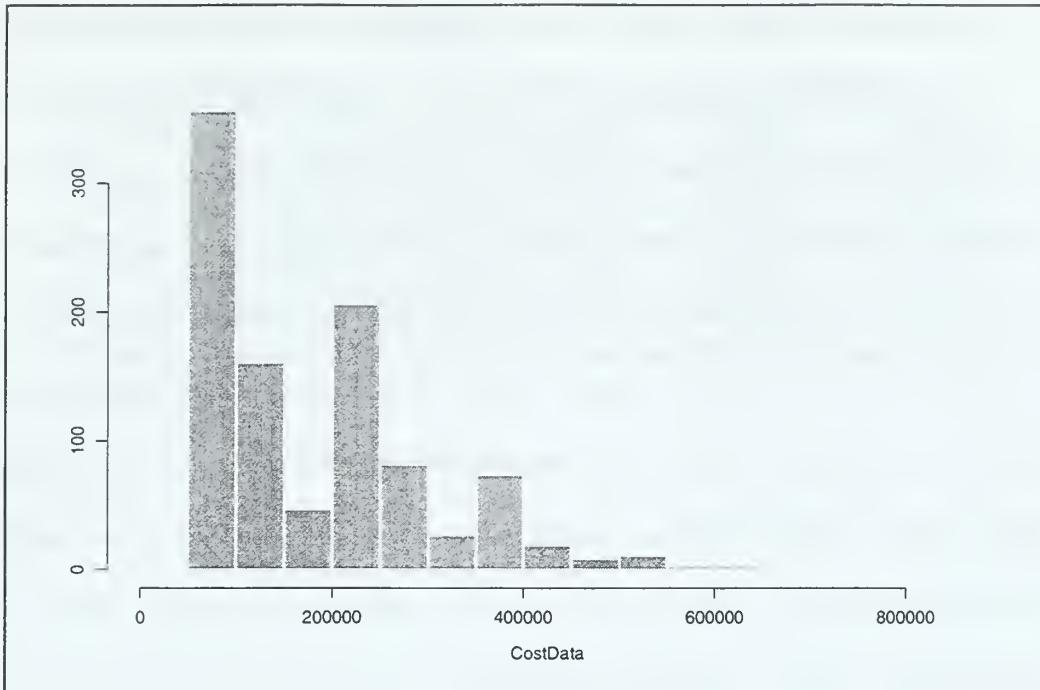
Figure 5. Histogram of Yearly Electrical Shock Mishap Costs

The expected costs of electrical shock mishap events are calculated for CY99 through CY03. The average annual cost for electrical shock mishap events of $182,459 is calculated in CY95 dollars. Future expected costs are converted to their applicable CY to adjust for inflation using cost estimation techniques justified in Appendix C. Figure 6 depicts the estimated future expected costs of electrical shock mishap events for CY99 through CY03 totaling over $1,000,000.
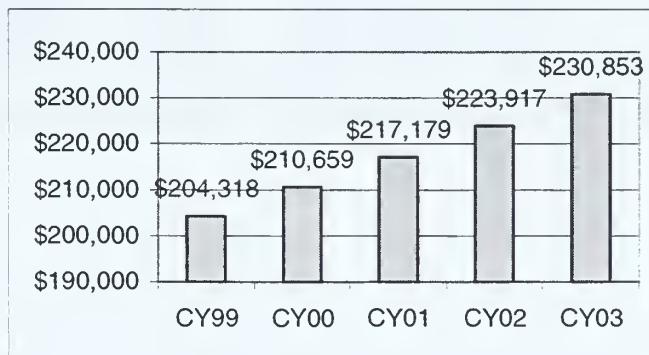
Figure 6. Estimated Future Expected Costs of Electrical Shock Mishap Events

F.   MISHAP EVENT REDUCTION AND COST SAVINGS ESTIMATES

The safety literature indicates two primary human factors orientated electrical shock hazard interventions are associated with equipment which is supplied electrical power, they are tagout of equipment and PPE. Tagout of equipment and PPE account for 343 (37.00%) of the 927 electrical shock mishaps (primary cause of 336 (37.45%) of the 897 mishap events). Another common human factors related intervention consists of basic Navy shipboard electrical safety precautions stressed routinely in Navy training. A mishap victim's inattentiveness, complacency, or violations accounts for another 199 (21.47%) of the mishaps (primary cause of 197 (21.96%) of the mishap events). Mishap event reduction and cost savings are estimated for 1 and 5 year periods based on 50, 60, and 70 percent reductions in these failed human factors related interventions as follows:

$$E[\text{Mishap Event Reduction}] = E[N(t)] * \% \text{ Intervention} * \% \text{ Reduction}$$

$$E[\text{Cost Savings}] = E[C(t)] * \% \text{ Intervention} * \% \text{ Reduction}$$

Table 19 presents potential reductions in electrical shock mishap events.

Percent	Years	Tagout	PPE	Both	Inattentiveness	Total	Reduction
50	1	25.88	22.19	8.01	32.89	88.97	29.71%
	5	129.39	110.97	40.06	164.44	444.86	29.71%
60	1	31.05	26.63	9.61	39.46	106.77	35.65%
	5	155.27	133.17	48.07	197.32	533.83	35.65%
70	1	36.23	31.07	11.22	46.04	124.56	41.59%
	5	181.15	155.36	56.09	230.21	622.81	41.59%

Table 19. Potential Electrical Shock Mishap Event Reductions

Table 20 presents potential cost savings of reduced electrical shock mishap events.

Percent	Years	Tagout	PPE	Both	Inattentiveness	Total
50	1	$17,653	$15,140	$5,466	$22,434	$60,693
	5	$93,910	$80,541	$29,075	$119,344	$322,871
60	1	$21,184	$18,168	$6,559	$26,921	$72,831
	5	$112,692	$96,649	$34,890	$143,213	$387,446
70	1	$24,714	$21,196	$7,652	$31,408	$84,970
	5	$131,475	$112,758	$40,705	$167,082	$452,020

Table 20. Potential Cost Savings of Electrical Shock Mishap Events

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V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

Personnel fatalities and injuries can dramatically affect U.S. Navy unit mission capability and operational readiness. Notably, electrical shock mishaps account for 33 percent of all personnel injuries occurring onboard U.S. Navy surface combatants from 1995 to 1997. Clearly this indicates a need for root cause identification and development of intervention strategies to prevent electrical shock. Post-hoc analysis of 897 Special Case Mishap Reports maintained by the Naval Safety Center, involving 927 personnel receiving an electrical shock from 1 January 1995 to 31 December 1997 is conducted in response to this need. The analysis includes initial data exploration, a human factors analysis, and stochastic modeling.

Initial data exploration results in descriptive statistics and categorical data relating to the mishap ship and victim and indicates some very salient features in the data. While one mishap results in a fatality and another in the permanent partial disability of a victim, most mishaps (99.6%) are Class "C" or less in severity. Aircraft Carriers and Combatants (cruisers, destroyers, and frigates) account for the majority of the mishaps (both were 32.0% respectively). Most of the victims are active duty Navy personnel (98.3%) and male (94.3%), and the typical rate of a victim is E-3 to E-5 (76.3%). While 58 different enlisted ratings are involved in electrical shock mishap events, 14 ratings: EM, AT, MM, ET, MS, HT, BM, EN, IC, OS, FC, RM, DC, and AE, account for a majority of the victims (60.8%).

A human factors analysis of the electrical shock mishap data reveals that an individual's decisions, actions, or inactions – is responsible for most of the events

(85.7%). A scenario analysis indicates many victims are involved in corrective maintenance at the time of a mishap (33.6%). The safety literature identifies two primary human factors interventions when working with electrical components and hazards, they are tagout of equipment and PPE. The failure to properly tagout equipment, wear PPE, or a combination of both accounts for a significant number of events (37.0%). Ironically, a mishap victim's inattentiveness, complacency, or violations of basic shipboard electrical safety account for a significant number of the remaining mishaps (21.5%).

Stochastic modeling is used to determine the mishap arrival process. The CY95 – CY96 data is used to formulate the model and the CY97 data is used to verify the model. The electrical shock mishap events are modeled as a Poisson process since this has proved successful in prior mishap studies. The human factors analysis permits the model to be composed of human factors and non-human factors components. Attributes of the Poisson process permit the estimated number of personnel receiving an electrical shock as a result of a mishap event (totaling to over 300 personnel per year) and the costs associated with electrical shock mishap events (over $200,000 per year) to be estimated through a Compound Poisson process. Finally, reductions in the failed human factors related interventions by 50, 60, and 70 percent are considered in the model to estimate their impact on future mishap frequencies and associated costs.

Finally, analysis of the mishap events reveals a wide range of quality inputs by the mishap ships in the mishap reports. Ships are providing what happened but the majority are failing to provide why the mishap occurs. This anomaly can be attributed to a failure of OPNAVINST 5100.19C, the current instruction regarding afloat mishap investigation and reporting, to provide proper reporting guidance. The safety literature

indicates a majority of mishap investigation and reporting systems experience the same problem.

B.   CONCLUSIONS

Clearly, initial data exploration and a human factors analysis permits salient features and predictive patterns to be identified in electrical shock mishaps. Aircraft Carriers, possessing the largest crew of any naval vessel, account for the highest number of mishaps (32.0%). The E-3, E-4, and E-5 rates are typically those that perform maintenance or other work activity with associated electrical hazards, and are the most common victims of electrical shocks (76.3%). The Navy's "electrical ratings", EM, AT, and ET, are 3 of the top 4 ratings involved in electrical shock mishaps. The fourth rating, MM, routinely works with electrical components or hazards in the engineering spaces.

The human factors concept of scenario analysis is invaluable in determining the root causes of electrical shock mishaps. Most victims (37.0%) are found to be not following rules and regulations since the two primary human factors causes relate to failed electrical hazard interventions: tagout of equipment and misuse of PPE. In addition, many personnel (21.5%) are not taking shipboard safety regulations seriously since a victim's inattentiveness, complacency, or violations account for a significant number of the remaining events.

Stochastic modeling is a valuable tool and proves statistically that the mishap arrival process can be estimated. As demonstrated in previous mishap studies, modeling mishap events using a Poisson process is an effective technique. Once constructed, the model provides the means to predict expected future mishap frequencies and associated costs. The impact of correcting failed electrical hazard human factors interventions, on

future mishap frequencies and associated costs, can be evaluated using the electrical shock mishap model formulated. This study indicates mishap events can be reduced by 19 percent (56 events) in one year with a 50 percent reduction in the failure of personnel to wear PPE or properly tagout equipment. In addition, the model indicates personnel injury costs alone will total over $1,000,000 in the next 5 years without interventions.

The problem associated with the current mishap reporting instruction, OPNAVINST 5100.19C, is its failure to provide direction and guidance on how to report why a mishap occurs. The instructions guidance is not conducive to gathering necessary information for the analysis of human factors related causes attributable to the occurrence of mishap events. In addition, the entry of mishap data into NAVSAFECEN's SIMS database by non-experienced shipboard Navy personnel indicates some discrepancies as to the real causes of mishap events.

C.   RECOMMENDATIONS

Initial data analysis indicates some very salient features of electrical shock mishaps that can be targeted for interventions. With Aircraft Carriers accounting for the highest number of mishaps, a focused electrical safety training and awareness program targeted at Carriers could eventually reduce the overall occurrence of mishap events by as much as 33 percent. In addition the "working rates" of E-3 – E-5, who account for over 75 percent of the mishaps, could also be targeted with focused electrical safety training. Considering a majority of the mishaps occur during corrective maintenance, these "working rates" are prime targets for electrical safety intervention strategies. In addition, the ratings of these rates experiencing a high number of mishaps are primarily the Navy's

"electrical ratings", EM, AT, and ET. Perhaps training, consisting of a basic refresher concerning electrical safety and hazards could alleviate the mishap problem.

Human factors analysis indicates failure of the two primary human factors related interventions, tagout of equipment and PPE, account for a majority of the mishaps. In addition, a victim's inattentiveness, complacency, or violations account for a majority of the remaining mishap events. These three failure areas are discussed in detail during semi-annual electrical safety training onboard surface ships. Perhaps the solution is not to require training to be conducted quarterly but simply a review of the training syllabus to identify methods for stressing the importance of these basic human factors related electrical safety interventions.

Post-hoc mishap analysis is only as good as the initial mishap report. The current instruction governing afloat mishap investigation and reporting, OPNAVINST 5100.19C, provides a format for reporting what happened but lacks direction on reporting why the mishap occurs. Since this research shows over 85 percent of electrical shock mishaps are attributable to human error, the why of a mishap is necessary to conduct a human factors analysis for root cause identification. It is recommended that NAVSAFECEN revise OPNAVINST 5100.19C and provide better guidance for reporting why the mishap occurred.

Once again, as in previous mishap studies, stochastic modeling through a Poisson process has proven successful. The attributes of this model permit future expected mishap frequencies and associated costs to be calculated through a relatively simple process. Perhaps a standard operating procedure of using this type of model for future mishap studies should be adapted.

Current mishap reporting guidance requires the mishap ship provide a narrative of the mishap event. An analysis of the mishap reports indicates numerous ships fail to discuss tagout of equipment or PPE, two of the primary human factors interventions when working with electrical components and hazards. Analysis indicates 37 percent of electrical shock mishaps are attributable to improper tagout of equipment, misuse of PPE, or a combination of the two. For electrical shock mishaps, ships must specifically state whether these interventions are required and whether they are implemented. In addition, ships are more concerned with describing the outstanding medical care provided to the victim or the excellent electrical safety training program the command possesses. This is not the intent of the mishap report; the intent is to provide NAVSAFECEN with what happened and why it happened. A revision of OPNAVINST 5100.19C would alleviate these issues and provide the necessary information to NAVSAFECEN for post-hoc human factors analysis.

In addition, NAVSAFECEN should consider modifications to their SIMS Database and the procedures for the entry of mishap reports into that database. SIMS is very generic and only provides the user with few options for data entry. For example, a user is only able to enter "personnel error", rather than the form of personnel error. This does not provide a database suitable to valuable queries for human factors analysis. In addition, data entry is not being performed by experienced Navy personnel who can assure the correct cause of mishaps are entered into the database. NAVSAFECEN possesses an outstanding and experienced Navy staff in the Afloat department who can contribute significantly to entry and development of a valuable database for further human factors analysis.

NAVSAFECEN should continue their outstanding approach in providing the fleet with shipboard safety issues through Ship's Safety Bulletins issued monthly and their award winning Fathom Magazine issued bi-monthly. For the prevention of electrical shock mishaps, the bulletins and magazines can focus on the Navy's Tagout and PPE Programs in addition to basic shipboard electrical safety. NAVSAFECEN has already commenced this approach and initial data exploration of CY98 data indicates a reduction in the rate of occurrence of electrical shock mishap events onboard surface combatants.

Finally, there are other high interest personnel injury mishaps that can be pursued. Back injury and toxic substance exposure contribute significantly to the total number of mishaps occurring annually onboard Navy surface combatants. This research indicates mishap events can be stochastically modeled, and through human factors analysis, root causes of mishaps can be identified and subsequently, intervention strategies can be considered, implemented, and evaluated for their effectiveness on future mishap frequencies and associated costs.

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APPENDIX A. SPECIAL CASE MISHAP REPORT EXAMPLE

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Event Serial: XXXXXX   Date: XX/XX/XXXX   Severity: A   OPERATIONAL
DOD Mishap Catg:  MARINE - NOT UNDERWAY MISHAP        Time: XXXX   DAY

Brief Narrative:
SNM WAS FATALLY ELECTROCUTED WHILE ADJ CONN BTWN CABLE/COMPRESSOR.

Event Narrative:
AT APPROX XXXX, WHILE MBR WAS ADJUSTING CONNECTION BETWEEN POWER CABLE
AND PORTABLE AIR COMPRESSOR, HE WAS ELECTROCUTED WITH 440 VOLTS 60 HZ,
AND RCVD SHOCK IN EXCESS OF 20 SEC.   SHIPMATES ON SCENE SECURED POWER
SUPPLY AND IMMEDIATELY CONTACTED MEDICAL DEPT.    EMERGENCY RESPONSE
CORPSMAN WAS ON SCENE WITHIN ONE MINUTE.   SHIP'S MEDICAL OFFICER WAS ON
SCENE WITHIN 30 SEC OF CORPSMAN'S ARRIVAL.    CPR WAS INITIATED
IMMEDIATELY.    DEFIBRILLATOR WAS ON SCENE WITHIN TWO MINUTES.    INITIAL
EVALUATION NECESSITATED USE OF DEFIBRILLATOR AND ADVANCED
CARDIOPULMONARY LIFE SUPPORT.   SECOND MEDICAL OFFICER ARRIVED SHORTLY
AFTER INITIATION OF FIRST DEFIBRILLATION.   MEDICAL CARE PROVIDED ON
SCENE UNTIL ARRIVAL OF AMBULANCE AT APPROX XXXX.    AMBULANCE DEPARTED
FOR HOSPITAL AT APPROX XXXX.   MEDICAL CARE CONTINUED IN AMBULANCE BY
SHIP'S SENIOR MEDICAL OFFICER AND INDEPENDENT DUTY CORPSMAN.    AMBULANCE
ARRIVED AT HOSPITAL AT APPROX XXXX.   EMERGENCY MEDICAL CARE CONTINUED
UNTIL APPROX XXXX, AT WHICH TIME SVCMBR WAS DECLARED DEAD.

Port or Strait:  XXXXXXXXXX

Cost Matrix:
     Event Injury Cost:            $    125,000
     Event DOD Property Cost:      $          0
     Event NON-DOD Property Cost:  $          0
        Total Event Cost:         $    125,000
```

Fatalities/Injuries Occurring in Event:

	Navy Mil	Navy Fed Civ	Other
Fatality (A,U,L)	1	0	0
Perm Total Dis (B)	0	0	0
Perm Partial Dis (C)	0	0	0
Major Injury (D)	0	0	0
Minor Injury (E)	0	0	0
First Aid (F)	0	0	0
No Injury (G)	0	0	0
Missing/Unknown (X)	0	0	0

```
Involved Activity:  XXXXX
UIC:  XXXXXX    XX XX   Prototype Hull:  XX

Ship Status:  MOORED (NOT IN SHIPYARD)
Evolution:  UPKEEP/AVAILABILITY

Mishap Type:  1  ELECTRICAL (BURN/SHOCK)
              2  EQUIPMENT INSTALLATION/REPAIR MAINTENANCE
Mishap Type:  1  ELECTRICAL (BURN/SHOCK)
              2  EQUIPMENT INSTALLATION/REPAIR MAINTENANCE
```

```
Number of Lost Operating Days for the Activity:          0

Pers Catg: ENLISTED NON-AIRCREW
Service Status:  NAVY   ACTIVE
Rank/Rate:  PO2        Rating:  MM2        Paygrade:  E05
Sex:  X      Age:  XX      Duty Status:  ON DUTY

Overall Injury:  FATAL INJURY
Specific Injuries:    (* denotes primary injury)
*   Body Part:  TOTAL BODY
*     Locn:  TOTAL BODY
*        Diagnosis:  ELECTRICAL SHOCK
Osha Occupational Ill?  OCCUPATIONAL INJURY

Number of Lost Workdays                         0

General Area:  ENGINEERING SPACES
  Specific Area:  MACHINERY ROOM
Job Catg:  WATCHSTANDER
Job/Action:  INSTALLATION/REMOVAL (EQUIPMENT/MATERIAL)
Experience with this Job/Action:     Months     Hrs Awake Prior to Event:
Object Involved:  ELECTRICAL APPARATUS
Accident Type:  CONTACT WITH ELECTRIC CURRENT
Injury Mishap Type:  ELECTRICAL (BURN/SHOCK)
                     EQUIPMENT INSTALLATION/REPAIR MAINTENANCE

General Cause Factors:  PERSONNEL AND MATERIAL

Specific Personnel Cause Factors:
(* denotes injured person injured himself)
* Cause Person Catg:  WATCHSTANDER
Job/Action:  INSTALLATION/REMOVAL (EQUIPMENT/MATERIAL)
Experience With This Job/Action:     Months
  What:  FAILED TO USE/PROPERLY USE TOOL/EQUIPMENT FOR JOB
    Why:  LACK OF ABILITY APART FROM TRAINING/EXPERIENCE
    Why:  INSUFFICIENT EXPERIENCE/SKILL/TRAINING

  Cause Person Catg:  SUPERVISOR/FOREMAN
Service Status:  NAVY   ACTIVE              Duty Status:  ON DUTY
Job/Action:  UNKNOWN/NOT REPORTED
Experience With This Job/Action:     Months
  What:  FAILED TO SUPERVISE PROGRESS OF WORK
    Why:  LACK OF CONCERN/INTEREST
    Why:  INADEQUATE KNOWLEDGE OF MEN/EQUIPMENT

Specific Material Cause Factors:
Cause    CABLE
Equip:  440V ELECTRICAL CABLE
Was Equip Grounded?  NO        Hardwired?  NO        Portable?  YES
  What:  SHORTED     Why:  IMPROPER TYPE     Why:  INSUFFICIENT PMS
Cause    COMPRESSOR
Equip:  PORTABLE AIR COMPRESSOR
Was Equip Grounded?  NO        Hardwired?  NO        Portable?  YES
  What:  SHORTED     Why:  NOT GROUNDED

Specific Environmental Cause Factors:  NO DATA
Specific Procedural Cause Factors:  NO DATA
```

APPENDIX B. MISHAP DATABASE SUMMARY

The abbreviated database is provided with column categories as follows:

Column 1   date of mishap

Column 2   ship location

Column 3   ship evolution

Column 4   cost of mishap

Column 5   mishap severity

Column 6   fleet ship assigned

Column 7   ship type

Column 8   victim service

Column 9   victim duty status

Column 10   victim rate/rank

Column 11   victim rating

Column 12   victim gender

Column 13   victim age

Column 14   hospitalized days

Column 15   restricted activity days

Column 16   lost work days

Column 17   victim task experience

Column 18   victim prior activity

Column 19   general mishap cause factor

Column 20   specific mishap cause

(shaded events indicate multiple personnel shocked)

1/2/95	u/w	ISE	$147	D	Pac	CV	N	Act	E4	SK	M	24	0	0	0	-	T/S	Per	PPE
1/2/95	yard	ovhl	$1,031	C	Pac	DD	N	Act	E5	EN	M	24	1	0	1	48	Maint	Per	Tag
1/4/95	inpt	upkp	$147	D	Pac	AD	N	Act	E4	ET	M	22	0	0	0	42	Maint	Per	PPE
1/4/95	u/w	ISE	$147	D	Pac	CV	N	Act	E2	IC	M	22	0	0	0	-	Wtch	Per	own
1/5/95	u/w	ISE	$147	D	Lan	CG	N	Act	E5	ET	M	27	0	0	0	-	T/S	Per	own
1/5/95	inpt	upkp	$147	D	Lan	AS	N	Act	E6	EA	M	20	0	0	0	2	Hsekp	Per	own
1/6/95	inpt	upkp	$147	D	Pac	DD	N	Act	E4	BM	M	21	0	0	0	12	Train	Per	oth
1/7/95	anch	upkp	$147	D	Lan	MCM	N	Act	E5	STG	M	34	0	0	0	6	Maint	Per	own
1/9/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AS	M	26	0	0	0	90	T/S	Per	Tag
1/9/95	inpt	upkp	$147	D	Pac	ARS	N	Act	E8	QM	M	-	0	0	0	-	Inspt	Mat	n/a
1/13/95	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	STG	M	23	0	0	0	32	Hsekp	Per	oth
1/13/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	MM	M	23	0	0	0	15	Wtch	Per	own
1/19/95	yard	ovhl	$147	D	Lan	DD	N	Act	E5	FC	M	24	0	0	0	10	T/S	Per	Tag
1/20/95	yard	ovhl	$1,031	C	Pac	DD	N	Act	E3	GSE	M	22	1	0	1	-	T/S	Per	PPE
1/22/95	u/w	ISE	$147	D	Lan	AGF	N	Act	E4	FC	M	21	0	0	0	12	T/S	Per	PPE
1/23/95	inpt	upkp	$147	D	Pac	AD	N	Act	E5	ET	M	27	0	0	0	-	Maint	Per	own
1/23/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E2	SA	M	20	0	0	0	12	Wtch	Per	oth
1/26/95	u/w	flops	$147	D	Pac	LHA	N	Act	E4	DS	M	20	0	0	0	24	Maint	Per	both
1/26/95	inpt	upkp	$147	D	Lan	AGF	N	TAR	E2	FA	M	19	0	0	0	4	Maint	Per	own
1/26/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AT	M	20	0	0	0	15	Maint	Per	Tag
1/29/95	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	FC	M	22	0	0	0	2	T/S	Per	Tag
1/30/95	inpt	upkp	$147	D	Pac	CGN	N	Act	E4	SH	M	28	0	0	0	24	Maint	Per	own
2/1/95	u/w	ISE	$147	D	Pac	FFG	N	Act	E4	BM	M	22	0	0	0	18	T/S	Mat	n/a
2/2/95	u/w	ISE	$147	D	Lan	CV	N	Act	E2	AA	M	19	0	0	0	2	Wtch	Per	own
2/3/95	inpt	upkp	$230	D	Lan	LPD	N	Act	E5	EM	M	24	0	1	0	60	Maint	Per	Tag
2/3/95	inpt	upkp	$147	D	Pac	AGF	N	Act	E5	EM	M	24	0	0	0	12	PMS	Per	Tag
2/3/95	u/w	ISE	$690	C	Lan	LPD	N	Act	E4	ET	M	22	0	1	1	48	T/S	Per	Tag
2/4/95	inpt	upkp	$1,031	C	Lan	AO	N	Act	E5	ET	F	31	1	0	1	-	Maint	Per	both
2/5/95	u/w	ISE	$147	D	Pac	AS	N	Act	E1	SR	F	20	0	0	0	1	Fdprp	Mat	n/a
2/6/95	inpt	upkp	$147	D	Lan	CG	N	Act	E7	EM	M	34	0	0	0	-	Train	Mat	n/a
2/8/95	inpt	upkp	$147	D	Lan	AS	N	Act	E6	MS	M	34	0	0	0	-	Wtch	Mat	n/a
2/9/95	yard	ovhl	$147	D	Pac	CG	N	Act	E4	FC	M	24	0	0	0	-	Maint	Per	oth
2/15/95	yard	upkp	$147	D	Lan	CV	N	Act	E4	AT	M	20	0	0	0	6	Wtch	Per	oth
2/15/95	yard	upkp	$147	D	Lan	CV	N	Act	E4	EM	M	20	0	0	0	8	Wtch	Per	oth
2/16/95	inpt	upkp	$147	D	Pac	DDG	N	Act	E5	OS	M	25	0	0	0	24	PMS	Per	PPE
2/16/95	inpt	upkp	$147	D	Lan	CGN	N	Act	E6	MM	M	25	0	0	0	-	Maint	Mat	n/a
2/17/95	inpt	upkp	$147	D	Pac	AE	N	Act	E4	MM	F	21	0	0	0	24	T/S	Per	Tag
2/20/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E7	MM	M	31	0	0	0	18	DC	Per	own
2/20/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	MM	M	23	0	0	0	25	DC	Per	own
2/20/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	MM	M	23	0	0	0	40	DC	Per	own
2/21/95	u/w	ISE	$147	D	Pac	DDG	N	Act	E4	HT	M	27	0	0	0	30	Weld	Per	own
2/21/95	inpt	upkp	$147	D	Lan	AD	N	Act	E2	MS	F	25	0	0	0	-	Hsekp	Per	Tag
2/21/95	u/w	ISE	$147	D	Pac	DDG	N	Act	E7	HT	M	37	0	0	0	-	Maint	Per	Tag
2/22/95	inpt	upkp	$1,031	C	Lan	FFG	N	Act	E4	EM	M	20	1	0	1	6	Maint	Per	PPE
2/22/95	yard	upkp	$147	D	Lan	CVN	N	Act	E4	ABH	M	22	0	0	0	3	Hsekp	Per	oth
2/22/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AE	M	24	0	0	0	48	Maint	Per	own
2/22/95	inpt	upkp	$147	D	Lan	AD	N	Act	E2	MS	F	33	0	0	0	2	Hsekp	Per	Tag
2/23/95	u/w	ISE	$147	D	Pac	LHA	N	Act	E2	BT	M	-	0	0	0	18	Maint	Per	both
2/24/95	u/w	ISE	$147	D	Pac	AE	N	Act	E2	EM	F	20	0	0	0	2	Maint	Per	own
2/24/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	25	0	0	0	9	Maint	Per	own

2/25/95	inpt	upkp	$1,610	D	Pac	LHA	N	Act	E4	HT	M	23	0	7	0	-	Weld	Per	PPE
3/6/95	inpt	upkp	$147	D	Pac	FFG	N	Act	E3	STG	M	19	0	0	0	6	Rehab	Per	own
3/6/95	u/w	ISE	$147	D	Lan	DD	N	Act	E4	EM	M	25	0	0	0	24	PMS	Per	Tag
3/7/95	inpt	upkp	$147	D	Pac	AE	N	Act	E5	RM	M	28	0	0	0	18	Wtch	Mat	n/a
3/7/95	inpt	upkp	$147	D	Pac	AE	N	Act	E4	RM	M	23	0	0	0	-	T/S	Per	Tag
3/8/95	u/w	ISE	$147	D	Lan	DD	N	Act	E4	ET	M	22	0	0	0	60	T/S	Per	Tag
3/9/95	inpt	upkp	$147	D	Lan	LPD	N	Act	E5	MM	M	23	0	0	0	9	PMS	Per	Tag
3/10/95	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AS	M	19	0	0	0	8	Maint	Per	PPE
3/14/95	inpt	upkp	$2,871	C	Lan	FFG	N	Act	E7	MM	M	-	1	0	5	15	Maint	Mat	n/a
3/14/95	inpt	upkp	$147	D	Pac	LSD	N	Act	E3	SN	M	22	0	0	0	-	Wtch	Per	oth
3/16/95	yard	ovhl	$147	D	Lan	CV	N	Act	E4	YN	M	22	0	0	0	24	Hsekp	Per	oth
3/16/95	inpt	upkp	$147	D	Pac	LHA	N	Act	E2	SA	M	18	0	0	0	2	PMS	Mat	n/a
3/18/95	yard	upkp	$147	D	Lan	LSD	N	Act	E4	HM	M	24	0	0	0	-	Inspt	Per	own
3/21/95	inpt	upkp	$147	D	Lan	CV	N	Act	E3	FN	M	20	0	0	0	6	Wtch	Mat	n/a
3/23/95	inpt	upkp	$147	D	Pac	LPD	N	Act	E2	FA	M	20	0	0	0	-	Maint	Per	PPE
3/25/95	u/w	unrep	$68,206	C	Lan	AOE	N	Act	E6	BT	M	38	26	180	26	5	DC	Per	both
3/26/95	u/w	unrep	$147	C	Lan	AOE	N	Act	WO2	CWO	M	-	0	0	0	-	DC	Per	both
3/27/95	u/w	ISE	$147	D	Lan	LHD	N	Act	E5	OS	M	32	0	0	0	144	Maint	Per	Tag
3/27/95	yard	ovhl	$147	D	Lan	CV	N	Act	E3	IC	M	21	0	0	0	9	Maint	Per	Tag
3/29/95	yard	ovhl	$147	D	Pac	DD	N	TAR	E3	SN	M	26	0	0	0	-	Wtch	Mat	n/a
3/30/95	inpt	upkp	$147	D	Pac	DD	N	Act	E5	ET	M	26	0	0	0	8	Maint	Per	own
4/3/95	inpt	upkp	$147	D	Lan	CG	N	Act	E5	MS	M	26	0	0	0	6	Fdprp	Mat	n/a
4/5/95	u/w	ISE	$147	D	Lan	LPD	N	Act	E4	MS	M	28	0	0	0	-	Hsekp	Per	Tag
4/9/95	inpt	upkp	$147	D	Lan	AS	N	Act	E2	SA	M	20	0	0	0	18	Maint	Per	Tag
4/10/95	u/w	ISE	$690	C	Lan	FFG	N	Act	E3	GSE	M	21	0	1	1	18	Hsekp	Mat	n/a
4/10/95	inpt	upkp	$147	D	Lan	DD	N	Act	E5	STG	M	22	0	0	0	42	Rehab	Per	own
4/10/95	u/w	ISE	$690	C	Lan	FFG	N	Act	E4	EM	M	24	0	1	1	48	T/S	Per	Tag
4/12/95	u/w	ISE	$147	D	Pac	LSD	N	Act	E5	EN	M	26	0	0	0	18	Wtch	Per	Tag
4/12/95	u/w	ISE	$147	D	Pac	LSD	N	Act	E4	GSM	M	22	0	0	0	6	Wtch	Per	Tag
4/12/95	yard	ovhl	$147	D	Lan	LPD	N	Act	E3	PN	M	22	0	0	0	-	Hsekp	Per	oth
4/13/95	inpt	upkp	$147	D	Lan	LHA	N	Act	E4	FC	M	28	0	0	0	10	Maint	Per	oth
4/13/95	u/w	flops	$147	D	Pac	CV	N	Act	E3	AE	M	-	0	0	0	12	Maint	Per	own
4/13/95	u/w	flops	$147	D	Pac	CV	N	Act	E4	AC	M	21	0	0	0	36	Maint	Per	own
4/14/95	u/w	ISE	$147	D	Pac	CV	N	Act	E3	OS	M	22	0	0	0	7	Hsekp	Per	own
4/15/95	inpt	upkp	$147	D	Lan	MHC	N	Act	E7	EN	M	33	0	0	0	-	Maint	Per	PPE
4/14/95	u/w	ISE	$1,031	C	Lan	CVN	N	Act	E4	ET	M	23	1	0	1	42	Maint	Per	own
4/14/95	inpt	upkp	$147	D	Lan	CVN	N	Act	E5	AT	M	25	0	0	0	60	Maint	Per	own
4/20/95	inpt	upkp	$147	D	Lan	AS	N	Act	E3	SN	M	18	0	0	0	6	Maint	Per	own
4/24/95	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AO	M	24	0	0	0	24	Maint	Mat	n/a
4/24/95	inpt	upkp	$147	D	Pac	CV	N	Act	E3	AE	M	21	0	0	0	2	Grind	Per	PPE
4/25/95	u/w	ISE	$147	D	Pac	AS	N	Act	E4	HT	M	27	0	0	0	60	Weld	Per	PPE
4/26/95	yard	upkp	$147	D	Lan	LCC	N	Act	E5	MS	F	38	0	0	0	1	Wtch	Per	own
5/1/95	u/w	ISE	$460	C	Pac	AOE	N	Act	E3	SN	M	22	0	0	1	20	Train	Per	both
5/3/95	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	ET	M	-	0	0	0	24	Hsekp	Per	own
5/3/95	inpt	upkp	$147	D	Lan	LSD	N	Act	E5	IC	M	26	0	0	0	24	T/S	Per	Tag
5/3/95	u/w	flops	$460	C	Pac	CVN	N	Act	E5	AO	M	24	0	0	1	96	Wtch	Per	own
5/4/95	yard	ovhl	$147	D	Lan	DD	N	Act	E3	SN	M	20	0	0	0	2	Rehab	Per	Tag
5/4/95	u/w	flops	$147	D	Pac	unk	N	Act	E4	AO	M	24	0	0	0	60	Wtch	Per	oth
5/8/95	u/w	ISE	$147	D	Pac	CG	N	Act	E5	FC	M	23	0	0	0	18	Maint	Per	own
5/9/95	u/w	ISE	$147	D	Lan	CGN	N	Act	E3	HT	M	22	0	0	0	6	Weld	Per	PPE

5/10/95	inpt	upkp	$147	D	Lan	AS	N	Act	E2	SA	M	20	0	0	0	18	Maint	Per	Tag
5/12/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	EM	M	24	0	0	0	42	Maint	Per	both
5/12/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	ET	M	22	0	0	0	12	Maint	Per	own
5/12/95	inpt	upkp	$147	D	Pac	FFG	N	Act	E6	EN	M	-	0	0	0	96	Inspt	Mat	n/a
5/12/95	yard	ovhl	$147	D	Lan	DD	N	Act	E3	FN	M	22	0	0	0	9	Wtch	Per	oth
5/16/95	inpt	upkp	$147	D	Lan	LHA	N	Act	E6	BM	M	-	0	0	0	-	Wtch	Mat	n/a
5/17/95	inpt	upkp	$147	D	Lan	AD	N	Act	E3	DC	F	21	0	0	0	7	Train	Per	PPE
5/17/95	inpt	upkp	$147	D	Pac	LHD	N	Act	E3	FN	M	19	0	0	0	7	Maint	Per	both
5/17/95	u/w	ISE	$147	D	Pac	LSD	N	Act	E5	ET	M	28	0	0	0	84	Maint	Per	PPE
5/18/95	u/w	ISE	$147	D	Lan	MCM	N	Act	E6	EN	M	36	0	0	0	108	Wtch	Per	own
5/18/95	yard	ovhl	$147	D	Pac	FFG	N	Act	E3	RM	M	21	0	0	0	24	Wtch	Per	oth
5/19/95	inpt	upkp	$147	D	Pac	LHA	N	Act	E3	DC	M	20	0	0	0	24	PMS	Per	oth
5/21/95	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AT	M	20	0	0	0	14	T/S	Per	own
5/24/95	yard	conv	$147	D	Lan	CVN	N	Act	E3	RM	M	18	0	0	0	-	Hsekp	Per	oth
5/24/95	yard	upkp	$147	D	Lan	FFG	N	Act	E3	BM	M	-	0	0	0	42	Maint	Per	oth
5/24/95	u/w	ISE	$147	D	Pac	LSD	N	Act	E6	MM	M	32	0	0	0	8	DC	Per	own
5/26/95	u/w	ISE	$1,031	C	Pac	CVN	N	Act	E5	DS	M	24	1	0	1	60	Maint	Per	PPE
5/26/95	inpt	upkp	$147	D	Pac	CG	N	Act	E4	EM	M	22	0	0	0	0	Maint	Per	PPE
5/26/95	u/w	ISE	$147	D	Pac	CV	N	Act	E4	AE	M	21	0	0	0	18	Maint	Per	own
5/26/95	inpt	upkp	$460	C	Lan	DD	N	Act	E5	GMG	M	30	0	0	1	24	PMS	Per	oth
5/30/95	inpt	upkp	$1,721	C	Lan	MCM	N	Act	E4	MS	M	20	1	1	2	13	Hsekp	Per	own
5/30/95	yard	ovhl	$147	D	Lan	CV	N	Act	E5	BM	M	31	0	0	0	62	Hsekp	Per	oth
6/2/95	u/w	flops	$460	D	Pac	CVN	N	Act	E5	AE	M	21	0	2	0	60	T/S	Per	own
6/2/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	24	0	0	0	24	T/S	Per	own
6/2/95	u/w	flops	$147	D	Lan	CVN	N	Act	E4	EM	M	27	0	0	0	40	Hsekp	Per	PPE
6/4/95	yard	ovhl	$147	D	Lan	DD	N	Act	E4	DS	M	33	0	0	0	48	Maint	Mat	n/a
6/6/95	inpt	upkp	$147	D	Pac	AS	N	Act	E3	FN	M	21	0	0	0	20	T/S	Per	PPE
6/6/95	yard	ovhl	$147	D	Lan	DD	N	Act	E4	DS	M	26	0	0	0	1	Maint	Per	Tag
6/7/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E5	ET	M	36	0	0	0	33	Maint	unk	n/a
6/7/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E7	IC	M	34	0	0	0	165	Maint	Per	Tag
6/8/95	inpt	upkp	$147	D	Lan	LHA	N	Act	E8	OS	M	43	0	0	0	-	Inspt	Mat	n/a
6/11/95	yard	upkp	$147	D	Pac	CGN	N	Act	E6	MM	M	26	0	0	0	36	Wtch	unk	n/a
6/13/95	inpt	upkp	$460	D	Lan	FFG	N	Act	E4	GSE	M	20	0	2	0	-	Maint	Per	PPE
6/13/95	inpt	upkp	$153,286	A	Lan	AS	N	Act	E5	MM	M	28	0	0	Fatal	-	Maint	Per	both
6/13/95	yard	ovhl	$147	D	Lan	CV	N	Act	E4	IC	M	31	0	0	0	264	Maint	Per	PPE
6/14/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AT	M	21	0	0	0	5	T/S	Per	Tag
6/14/95	inpt	upkp	$147	D	Pac	CV	N	Act	E2	FA	M	21	0	0	0	11	T/S	Per	both
6/14/95	inpt	upkp	$147	D	Lan	AS	N	Act	E3	DK	F	22	0	0	0	6	Hsekp	Per	PPE
6/15/95	inpt	upkp	$147	D	Lan	LPH	N	Act	E4	ABF	M	21	0	0	0	5	Maint	Per	oth
6/17/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	MS	M	26	0	0	0	24	T/S	Per	both
6/19/95	inpt	upkp	$147	D	Pac	CG	N	Act	E7	EN	M	37	0	0	0	240	Maint	Per	both
6/19/95	inpt	upkp	$147	D	Lan	LSD	N	Act	E4	EM	M	23	0	0	0	36	Maint	Mat	n/a
6/19/95	inpt	upkp	$147	D	Lan	LSD	N	Act	E5	EN	M	24	0	0	0	-	T/S	Per	own
6/19/95	u/w	ISE	$147	D	Lan	AS	N	Act	E4	IC	M	21	0	0	0	6	Wtch	Mat	n/a
6/20/95	inpt	upkp	$147	D	Pac	AE	N	Act	E4	BM	M	26	0	0	0	2	Maint	Per	PPE
6/21/95	inpt	upkp	$147	D	Lan	LPD	N	Act	E2	FA	M	21	0	0	0	22	Maint	Per	own
6/21/95	inpt	upkp	$147	D	Pac	CG	N	Act	E5	FC	M	23	0	0	0	36	Maint	Per	Tag
6/22/95	yard	ovhl	$147	D	Lan	DD	N	Act	E5	FC	M	23	0	0	0	60	Wtch	Mat	n/a
6/23/95	inpt	upkp	$14,815	C	Pac	FFG	N	Act	E6	EM	M	37	5	0	26	218	T/S	Per	both
6/23/95	inpt	upkp	$147	D	Lan	AD	N	Act	E4	MS	M	26	0	0	0	3	Maint	Per	own

6/26/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E5	EN	M	30	0	0	0	33	Hsekp	Mat	n/a
6/29/95	inpt	upkp	$147	D	Lan	AD	N	Act	E6	ET	M	27	0	0	0	36	Maint	Per	own
6/29/95	inpt	upkp	$147	D	Lan	AD	N	Act	E4	ET	F	25	0	0	0	48	Maint	Per	own
6/29/95	inpt	upkp	$147	D	Lan	AD	N	Act	E7	EM	M	28	0	0	0	144	Maint	Per	own
6/29/95	inpt	upkp	$147	D	Lan	AD	N	Act	O3	LT	M	28	0	0	0	36	Maint	Per	own
6/30/95	inpt	upkp	$1,031	C	Lan	PC	N	Act	E5	EM	M	24	1	0	1	5	Maint	Per	own
6/30/95	u/w	ISE	$147	D	Lan	DD	N	Act	E5	OS	M	26	0	0	0	1	Wtch	Mat	n/a
7/3/95	inpt	upkp	$460	C	Pac	LCC	N	Act	E5	BM	M	39	0	0	1	24	Maint	unk	n/a
7/4/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AS	M	22	0	0	0	18	PMS	Per	Tag
7/4/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AO	F	24	0	0	0	4	Maint	Per	PPE
7/5/95	inpt	upkp	$147	D	Lan	DD	N	Act	E4	EN	M	21	0	0	0	20	Hsekp	Per	oth
7/5/95	inpt	upkp	$147	D	Lan	FFG	N	Act	E4	EN	M	21	0	0	0	40	Maint	Per	Tag
7/6/95	inpt	upkp	$147	D	Lan	CVN	N	Act	E4	ET	M	25	0	0	0	24	Maint	Per	own
7/7/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E6	OS	M	32	0	0	0	69	Wtch	Mat	n/a
7/8/95	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	AS	M	19	0	0	0	6	Maint	Per	own
7/8/95	inpt	upkp	$147	D	Lan	LPH	N	Act	E3	AO	M	21	0	0	0	3	Maint	Per	Tag
7/11/95	inpt	upkp	$147	D	Pac	CV	N	Act	E3	AO	M	21	0	0	0	-	Wtch	Per	oth
7/13/95	inpt	upkp	$147	D	Pac	DD	N	Act	E4	MS	M	26	0	0	0	18	Hsekp	Mat	n/a
7/14/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E6	EM	M	30	0	0	0	101	Wtch	Per	own
7/14/95	yard	ovhl	$460	C	Lan	DD	N	Act	E4	HT	M	22	0	0	1	33	Maint	Per	PPE
7/15/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	HT	M	24	0	0	0	48	Wtch	Per	oth
7/16/95	yard	ovhl	$147	D	Lan	CV	N	Act	E2	FA	M	19	0	0	0	-	Wtch	Per	oth
7/17/95	yard	ovhl	$147	D	Lan	CV	N	Act	E3	AK	M	21	0	0	0	-	Wtch	Envr	n/a
7/18/95	yard	ovhl	$147	D	Lan	DD	N	Act	E4	STG	M	24	0	0	0	36	Rehab	unk	n/a
7/18/95	yard	ovhl	$147	D	Pac	DD	N	Act	E5	DC	M	23	0	0	0	60	Wtch	Per	own
7/18/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AS	M	20	0	0	0	12	Maint	Per	PPE
7/18/95	u/w	flops	$460	C	Lan	CVN	N	Act	E2	AA	M	19	0	0	1	1	Wtch	Mat	n/a
7/20/95	inpt	upkp	$147	D	Pac	CV	N	Act	E3	IC	M	20	0	0	0	3	Maint	Per	PPE
7/21/95	inpt	upkp	$147	D	Pac	CG	N	Act	E4	FC	M	23	0	0	0	8	Maint	Per	own
7/22/95	inpt	upkp	$147	D	Pac	CV	N	Act	E4	AT	M	23	0	0	0	36	Maint	Per	both
7/22/95	u/w	ISE	$147	D	Lan	MCM	N	Act	E6	ET	M	33	0	0	0	24	Hsekp	Per	own
7/22/95	u/w	ISE	$147	D	Pac	CG	N	Act	E5	GSE	M	28	0	0	0	96	T/S	Per	both
7/23/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AMS	M	24	0	0	0	8	Maint	Per	PPE
7/25/95	yard	ovhl	$147	D	Lan	CV	N	Act	E4	EM	M	22	0	0	0	24	Maint	Per	PPE
7/25/95	yard	ovhl	$147	D	Pac	DD	N	Act	E4	EN	M	20	0	0	0	4	Maint	Per	own
7/25/95	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	EM	M	26	0	0	0	-	Hsekp	Mat	n/a
7/26/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E5	ET	M	22	0	0	0	24	Maint	Per	own
7/26/95	inpt	upkp	$147	D	Pac	unk	N	Act	E6	OS	M	27	0	0	0	36	Maint	Per	own
7/26/95	inpt	upkp	$147	D	Pac	LSD	N	Act	O3	LT	M	30	0	0	0	6	Inspt	Mat	n/a
7/28/95	yard	ovhl	$147	D	Lan	DD	N	Act	E2	SA	M	20	0	0	0	4	Maint	Per	own
7/29/95	inpt	upkp	$147	D	Lan	AD	N	Act	E1	FR	M	19	0	0	0	3	Maint	Per	own
7/30/95	u/w	ISE	$460	C	Pac	LHA	N	Act	E4	ABF	M	21	0	0	1	24	Wtch	Mat	n/a
8/3/95	yard	upkp	$147	D	Pac	AGF	N	Act	E3	SN	M	23	0	0	0	6	Rehab	Per	Tag
8/3/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E3	EM	M	23	0	0	0	36	Maint	Per	Tag
8/3/95	u/w	ISE	$147	D	Pac	AOE	N	Act	E4	MM	M	24	0	0	0	60	Maint	Per	Tag
8/4/95	inpt	upkp	$147	D	Pac	CV	N	Act	E3	AT	M	21	0	0	0	9	Maint	Per	own
8/5/95	u/w	ISE	$1,031	C	Pac	CVN	N	Act	E5	AT	M	24	1	0	1	30	T/S	Per	own
8/7/95	anch	upkp	$147	D	Pac	CVN	N	Act	E4	EM	M	23	0	0	0	4	PMS	Per	own
8/7/95	u/w	ISE	$147	D	Pac	AS	N	Act	E3	EM	F	21	0	0	0	24	Maint	Per	Tag
8/7/95	inpt	upkp	$147	D	Pac	LSD	N	Act	E4	IC	M	22	0	0	0	12	Maint	Per	own

8/9/95	inpt	upkp	$147	D	Pac	DDG	N	Act	E5	DC	M	23	0	0	0	22	PMS	Per	both
8/9/95	inpt	upkp	$147	D	Pac	CG	N	Act	E5	IC	M	23	0	0	0	36	Maint	Mat	n/a
8/9/95	inpt	ovhl	$147	D	Pac	DD	N	Act	E4	EN	M	23	0	0	0	17	Maint	Per	oth
8/10/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	ABE	M	24	0	0	0	18	Weld	Per	PPE
8/12/95	inpt	upkp	$147	D	Lan	CVN	N	Act	O3	LT	M	30	0	0	0	-	Inspt	Per	own
8/15/95	inpt	upkp	$147	D	Pac	AOR	N	Act	E3	AO	M	22	0	0	0	12	Maint	Per	Tag
8/16/95	yard	ovhl	$147	D	Lan	DD	N	Act	E5	HT	M	35	0	0	0	120	Weld	Per	PPE
8/18/95	u/w	ISE	$2,760	C	Lan	LST	N	TAR	E6	EM	M	36	0	10	1	96	Maint	Per	both
8/19/95	u/w	unrep	$147	D	Lan	AOE	N	Act	E6	BM	M	37	0	0	0	24	Wtch	Per	oth
8/19/95	u/w	unrep	$147	D	Lan	AOE	N	Act	E1	SR	M	20	0	0	0	1	Wtch	Per	oth
8/20/95	inpt	upkp	$147	D	Lan	DD	N	Act	E3	SN	M	20	0	0	0	17	Rehab	Per	Tag
8/20/95	inpt	upkp	$147	D	Lan	AS	N	Act	E2	SA	F	19	0	0	0	12	Wtch	Mat	n/a
8/21/95	inpt	upkp	$147	D	Pac	CGN	N	Act	E5	ET	M	22	0	0	0	24	T/S	Per	both
8/21/95	inpt	upkp	$147	D	Pac	DD	N	Act	O5	CDR	M	49	0	0	0	18	Inspt	Per	oth
8/21/95	u/w	ISE	$1,031	C	Pac	LPD	N	Act	E3	AN	M	21	1	0	1	1	Hsekp	Per	own
8/23/95	u/w	ISE	$147	D	Pac	CV	N	Act	E5	AT	M	23	0	0	0	17	Maint	Per	own
8/24/95	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AT	M	20	0	0	0	3	T/S	Per	own
8/24/95	yard	ovhl	$147	D	Lan	DD	N	Act	E5	EM	M	41	0	0	0	84	Maint	Per	Tag
8/25/95	yard	ovhl	$147	D	Lan	DD	N	Act	E5	QM	M	27	0	0	0	24	Rehab	Per	own
8/27/95	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AT	M	20	0	0	0	5	Maint	Per	own
8/28/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AT	M	23	0	0	0	42	Wtch	Per	oth
8/28/95	inpt	upkp	$147	D	Lan	AS	N	Act	E2	EM	M	19	0	0	0	14	Maint	Per	Tag
8/28/95	u/w	ISE	$147	D	Pac	unk	N	Act	E4	MS	M	28	0	0	0	-	Maint	Per	PPE
8/29/95	inpt	upkp	$147	D	Pac	CV	N	Act	E4	ET	M	23	0	0	0	36	Maint	Per	own
8/29/95	inpt	upkp	$147	D	Pac	DDG	N	Act	E5	EN	M	27	0	0	0	64	Train	Mat	n/a
8/31/95	inpt	upkp	$147	D	Pac	LSD	N	TAR	E4	BM	M	21	0	0	0	1	Inspt	Per	own
8/31/95	inpt	upkp	$147	D	Pac	LSD	N	TAR	E3	OS	M	20	0	0	0	6	Inspt	Mat	n/a
9/1/95	inpt	upkp	$147	D	Pac	CG	N	Act	E4	BM	M	22	0	0	0	24	Wtch	Mat	n/a
9/5/95	inpt	upkp	$147	D	Lan	FFG	N	Act	E1	SR	M	19	0	0	0	1	T/S	Per	PPE
9/6/95	u/w	ISE	$460	D	Pac	LSD	N	Act	E5	BM	M	28	0	2	0	84	Wtch	Per	own
9/6/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E3	EM	M	22	0	0	0	-	Maint	Per	Tag
9/8/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	AN	M	20	0	0	0	12	Wtch	unk	n/a
9/9/95	u/w	ISE	$147	D	Lan	DD	N	Act	E4	GSE	M	24	0	0	0	12	T/S	Per	own
9/11/95	u/w	ISE	$230	D	Pac	CVN	N	Act	E3	AN	F	23	0	1	0	3	Wtch	Mat	n/a
9/11/95	inpt	upkp	$147	D	Lan	FFG	N	Act	E3	EN	M	21	0	0	0	29	Maint	Mat	n/a
9/11/95	inpt	upkp	$147	D	Lan	CVN	N	Act	O3	LT	M	35	0	0	0	-	Maint	Per	oth
9/14/95	u/w	ISE	$147	D	Pac	FFG	N	Act	E3	MS	M	21	0	0	0	18	Hsekp	Per	own
9/14/95	u/w	ISE	$147	D	Pac	DDG	N	Act	E4	OS	M	19	0	0	0	2	Maint	Per	Tag
9/14/95	u/w	ISE	$147	D	Pac	FFG	N	Act	E4	GSM	M	22	0	0	0	28	Maint	Per	own
9/15/95	yard	ovhl	$230	D	Pac	DD	N	Act	E3	FN	M	19	0	1	0	12	Maint	Per	own
9/15/95	u/w	ISE	$147	D	Lan	LPD	N	Act	E3	FN	M	21	0	0	0	18	Maint	Mat	n/a
9/18/95	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	EM	M	21	0	0	0	16	Maint	Per	PPE
9/19/95	inpt	upkp	$147	D	Pac	LSD	N	Act	E4	IC	M	22	0	0	0	24	Maint	Per	Tag
9/19/95	inpt	upkp	$147	D	Lan	DD	N	Act	E2	RM	M	22	0	0	0	6	Hsekp	unk	n/a
9/19/95	inpt	upkp	$147	D	Pac	FFG	N	Act	E6	HT	M	38	0	0	0	36	T/S	Per	own
9/20/95	u/w	ISE	$147	D	Lan	CV	N	Act	E3	SN	M	21	0	0	0	24	Hsekp	Per	own
9/21/95	inpt	upkp	$147	D	Lan	DD	N	Act	E4	GSE	M	20	0	0	0	12	Maint	Per	own
9/21/95	inpt	upkp	$147	D	Lan	CVN	N	Act	E2	IC	M	20	0	0	0	6	Maint	Per	Tag
9/21/95	inpt	upkp	$147	D	Lan	DD	N	Act	E3	QM	M	21	0	0	0	18	T/S	Per	Tag
9/21/95	yard	ovhl	$147	D	Lan	FFG	N	Act	E5	ET	M	22	0	0	0	5	DC	Per	PPE

9/25/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E5	FC	M	28	0	0	0	120	Maint	Per	oth
9/25/95	yard	ovhl	$147	D	Pac	DD	N	Act	E5	CTR	F	33	0	0	0	4	Rehab	Per	own
9/27/95	inpt	upkp	$147	D	Lan	LPD	N	Act	E4	MM	M	24	0	0	0	24	Maint	Mat	n/a
9/28/95	u/w	ISE	$147	D	Pac	CV	N	Act	E2	AE	M	20	0	0	0	2	Maint	Per	own
9/28/95	inpt	upkp	$147	D	Lan	LST	N	Act	E4	EM	M	25	0	0	0	42	T/S	Per	own
9/29/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E4	EN	M	22	0	0	0	25	Hsekp	Per	own
10/2/95	u/w	ISE	$147	D	Pac	LHA	N	Act	E4	ET	M	20	0	0	0	2	Maint	Per	PPE
10/2/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	MS	M	26	0	0	0	84	Hsekp	Per	PPE
10/3/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	AT	M	24	0	0	0	60	T/S	Per	oth
10/5/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	DS	M	26	0	0	0	27	PMS	Per	own
10/5/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	AE	M	20	0	0	0	14	Maint	Per	own
10/5/95	inpt	upkp	$147	D	Lan	AS	N	Act	E3	FN	F	19	0	0	0	24	Wtch	Per	oth
10/5/95	yard	ovhl	$147	D	Lan	AOE	N	Act	E3	FN	M	21	0	0	0	5	Weld	Per	PPE
10/8/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AE	M	27	0	0	0	114	Maint	Per	own
10/9/95	u/w	ISE	$147	D	Lan	ARS	N	Act	E3	SN	M	21	0	0	0	1	Hsekp	Per	Tag
10/10/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E4	BM	M	24	0	0	0	48	PMS	Per	own
10/11/95	inpt	upkp	$147	D	Lan	AOE	N	Act	E3	SN	M	21	0	0	0	2	T/S	Per	PPE
10/11/95	yard	ovhl	$230	D	Pac	DD	N	Act	E1	TM	F	19	0	1	0	4	Hsekp	Per	oth
10/11/95	u/w	ISE	$147	D	Lan	FFG	N	Act	E5	EM	M	26	0	0	0	78	T/S	Per	Tag
10/12/95	u/w	ISE	$147	D	Lan	CG	N	Act	E2	SA	M	23	0	0	0	1	Wtch	Per	own
10/14/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E3	FN	M	20	0	0	0	12	DC	Per	own
10/16/95	inpt	upkp	$147	D	Lan	AS	N	Act	E3	FN	M	18	0	0	0	8	Hsekp	Per	oth
10/16/95	inpt	upkp	$147	D	Pac	CV	N	Act	E5	OS	M	22	0	0	0	30	T/S	Per	PPE
10/16/95	inpt	upkp	$147	D	Pac	CV	N	Act	E4	OS	M	24	0	0	0	30	Hsekp	Per	oth
10/17/95	u/w	ISE	$147	D	Lan	CV	N	Act	E4	DS	M	20	0	0	0	11	Maint	Per	oth
10/17/95	inpt	upkp	$147	D	Lan	CV	N	Act	E6	SK	M	27	0	0	0	-	Maint	Per	own
10/19/95	u/w	ISE	$147	D	Pac	CV	N	Act	E4	AT	M	21	0	0	0	1	Maint	Per	own
10/23/95	inpt	upkp	$147	D	Lan	PC	N	Act	E4	EM	M	22	0	0	0	15	T/S	Per	PPE
10/23/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	23	0	0	0	30	T/S	Per	own
10/24/95	inpt	upkp	$147	D	Pac	CV	N	Act	E4	ET	F	25	0	0	0	-	Maint	Mat	n/a
10/24/95	u/w	ISE	$147	D	Lan	CV	N	Act	E7	EM	M	41	0	0	0	6	Maint	Per	oth
10/26/95	yard	ovhl	$147	D	Lan	LPD	N	Act	E3	FN	M	21	0	0	0	2	Wtch	Per	own
10/26/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E4	IC	M	24	0	0	0	10	Maint	Per	own
10/26/95	inpt	ovhl	$147	D	Lan	CVN	N	Act	E4	AS	M	24	0	0	0	24	DC	Per	oth
10/27/95	inpt	upkp	$147	D	Lan	AD	N	Act	E4	QM	M	22	0	0	0	30	Maint	Per	PPE
10/30/95	inpt	upkp	$147	D	Lan	CV	N	Act	E5	MA	F	26	0	0	0	72	Wtch	unk	n/a
10/30/95	inpt	upkp	$147	D	Lan	AGF	N	Act	E4	BM	M	28	0	0	0	12	Maint	Per	own
10/31/95	yard	conv	$147	D	Lan	CVN	N	Act	E5	AT	M	23	0	0	0	8	Maint	Per	Tag
11/1/95	inpt	upkp	$147	D	Lan	LSD	N	Act	WO2	CWO	M	42	0	0	0	-	Inspt	Per	oth
11/3/95	u/w	ISE	$147	D	Lan	LSD	N	Act	E4	ET	M	24	0	0	0	23	Maint	Per	Tag
11/3/95	u/w	ISE	$147	D	Lan	AOE	N	Act	E3	SN	M	21	0	0	0	8	Hsekp	Per	oth
11/4/95	u/w	ISE	$147	D	Lan	CV	N	Act	E2	AA	M	19	0	0	0	14	Hsekp	Per	oth
11/6/95	inpt	upkp	$147	D	Lan	DDG	N	Act	E6	ET	M	30	0	0	0	24	T/S	Per	PPE
11/9/95	u/w	ISE	$147	D	Pac	DDG	N	Act	E4	FC	M	28	0	0	0	26	Maint	Per	own
11/11/95	u/w	ISE	$147	D	Lan	CV	N	Act	E3	AMS	M	20	0	0	0	24	Wtch	Per	oth
11/12/95	inpt	upkp	$147	D	Pac	LHA	N	Act	O3	LT	F	27	0	0	0	1	Wtch	Per	own
11/13/95	u/w	ISE	$147	D	Lan	AS	N	Act	E5	BM	M	30	0	0	0	120	Maint	Per	Tag
11/16/95	inpt	upkp	$147	D	Lan	AS	N	Act	E5	DP	F	27	0	0	0	6	Hsekp	Per	oth
11/17/95	inpt	upkp	$147	D	Pac	AGF	N	Act	E5	MM	M	34	0	0	0	24	T/S	Mat	n/a
11/18/95	u/w	ISE	$147	D	Pac	LHA	M	Act	E3	LCPL	M	22	0	0	0	37	T/S	Per	own

11/22/95	inpt	upkp	$147	D	Lan	CGN	N	Act	E4	CTR	M	26	0	0	0	-	Rehab	Mat	n/a
11/28/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E2	FA	M	20	0	0	0	13	Maint	Per	own
11/30/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	AE	M	24	0	0	0	3	Maint	Per	own
11/30/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	AT	M	23	0	0	0	48	Maint	Per	own
12/1/95	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	IC	M	19	0	0	0	-	T/S	Per	PPE
12/1/95	u/w	ISE	$1,031	C	Pac	LHA	N	Act	E4	IM	M	38	1	0	1	180	T/S	Per	own
12/2/95	inpt	upkp	$147	D	Lan	CV	N	Act	E6	SM	F	30	0	0	0	208	Maint	Per	PPE
12/2/95	inpt	upkp	$147	D	Lan	FFG	N	TAR	E4	ET	M	21	0	0	0	-	Maint	Per	Tag
12/2/95	inpt	upkp	$147	D	Lan	FFG	N	Act	E6	EN	M	36	0	0	0	-	Maint	Per	Tag
12/2/95	u/w	ISE	$460	C	Lan	CV	N	Act	E3	MS	M	21	0	0	1	6	Wtch	Mat	n/a
12/3/95	u/w	ISE	$147	D	Lan	LPH	N	Act	E5	EW	M	24	0	0	0	24	Wtch	Per	own
12/3/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	MS	M	-	0	0	0	50	Fdprp	Per	own
12/4/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	AT	M	29	0	0	0	24	Maint	Per	own
12/5/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E6	AT	M	39	0	0	0	-	Wtch	Mat	n/a
12/6/95	u/w	ISE	$147	D	Lan	LHA	N	Act	E5	QM	M	39	0	0	0	18	Wtch	Per	own
12/6/95	inpt	upkp	$147	D	Pac	CV	N	Act	E3	AT	M	20	0	0	0	-	Wtch	Per	oth
12/8/95	u/w	ISE	$147	D	Lan	DD	N	Act	E3	FN	M	21	0	0	0	24	Maint	Per	Tag
12/7/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E6	AT	M	27	0	0	0	18	Maint	Per	own
12/8/95	u/w	ISE	$147	D	Lan	DD	N	Act	E6	SM	M	31	0	0	0	38	Hsekp	Per	own
12/8/95	u/w	ISE	$147	D	Pac	LHA	N	Act	E6	SH	M	39	0	0	0	1	PMS	Per	Tag
12/9/95	anch	upkp	$690	C	Pac	DDG	N	Act	E6	GSM	M	35	0	1	1	12	Wtch	Per	own
12/11/95	inpt	upkp	$1,031	C	Lan	LSD	N	Act	E3	EM	M	20	1	0	1	6	Maint	Per	oth
12/11/95	u/w	ISE	$147	D	Pac	CV	N	Act	E4	AO	M	28	0	0	0	60	Wtch	Per	own
12/11/95	inpt	upkp	$147	D	Lan	AS	N	Act	E3	SN	M	20	0	0	0	19	PMS	Per	oth
12/12/95	inpt	upkp	$147	D	Pac	LSD	N	Act	E3	SN	M	20	0	0	0	1	Maint	Per	PPE
12/12/95	inpt	upkp	$147	D	Lan	MCM	N	Act	E5	IC	M	30	0	0	0	12	T/S	Per	Tag
12/13/95	u/w	ISE	$147	D	Lan	CV	N	Act	E3	AN	M	25	0	0	0	14	Wtch	Per	own
12/14/95	inpt	upkp	$147	D	Lan	CV	N	Act	E5	SK	M	26	0	0	0	12	PMS	Per	PPE
12/14/95	inpt	upkp	$147	D	Pac	LCC	N	Act	E4	ET	M	23	0	0	0	6	T/S	Per	Tag
12/16/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AT	M	24	0	0	0	30	Maint	Mat	n/a
12/22/95	inpt	upkp	$147	D	Lan	CVN	N	Act	E4	IC	M	21	0	0	0	18	T/S	Per	both
12/27/95	inpt	upkp	$147	D	Lan	MHC	N	Act	E4	MN	M	22	0	0	0	36	Maint	Per	Tag
12/28/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AE	M	25	0	0	0	36	T/S	Per	PPE
12/29/95	u/w	ISE	$147	D	Pac	CVN	N	Act	E2	SA	M	19	0	0	0	12	Maint	Per	own
1/1/96	inpt	upkp	$147	D	Pac	CV	N	Act	E7	GM	M	37	0	0	0	28	Wtch	Per	oth
1/3/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E3	AO	M	21	0	0	0	24	Hsekp	Per	PPE
1/3/96	inpt	upkp	$147	D	Pac	CVN	N	Act	E3	FN	M	22	0	0	0	25	Maint	Per	Tag
1/10/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AS	M	20	0	0	0	7	Maint	Per	own
1/11/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	IC	M	27	0	0	0	60	T/S	Per	PPE
1/12/96	yard	upkp	$147	D	Lan	MHC	N	Act	E4	EN	M	21	0	0	0	-	Maint	Per	oth
1/13/96	inpt	upkp	$147	D	Pac	LHD	N	Act	E4	AS	M	23	0	0	0	30	Maint	Per	own
1/16/96	u/w	ISE	$147	D	Pac	DD	N	Act	E4	TM	M	21	0	0	0	20	Grind	Per	PPE
1/16/96	inpt	upkp	$147	D	Lan	AOE	N	Act	E3	GMG	M	22	0	0	0	24	Hsekp	Per	own
1/17/96	inpt	upkp	$147	D	Lan	LPH	N	Act	E4	ET	M	19	0	0	0	6	PMS	Per	both
1/18/96	inpt	upkp	$147	D	Pac	AS	N	Act	E4	HT	M	25	0	0	0	36	Wtch	Per	oth
1/18/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	FN	M	28	0	0	0	12	Weld	Per	own
1/22/96	inpt	upkp	$147	D	Pac	LHD	N	Act	E4	ET	M	27	0	0	0	36	T/S	Per	PPE
1/22/96	u/w	ISE	$147	D	Pac	CV	N	Act	E4	IC	M	25	0	0	0	36	T/S	Per	Tag
1/22/96	u/w	ISE	$147	D	Pac	DD	N	Act	E4	EM	M	23	0	0	0	10	T/S	Mat	n/a
1/25/96	inpt	upkp	$460	C	Pac	PC	N	Act	E4	GMG	M	26	0	0	1	20	PMS	Per	own

1/26/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E5	GSE	M	22	0	0	0	18	Maint	Per	Tag
1/27/96	u/w	ISE	$147	D	Lan	CV	N	Act	E3	AN	M	21	0	0	0	-	Hsekp	Per	own
1/28/96	u/w	ISE	$147	D	Lan	LPD	N	Act	E1	MM	M	25	0	0	0	6	Maint	Per	own
1/29/96	inpt	upkp	$147	D	Pac	DD	N	Act	E5	GSM	M	26	0	0	0	12	Maint	Per	Tag
1/29/96	inpt	upkp	$147	D	Lan	FFG	N	Act	O1	ENS	M	23	0	0	0	13	Maint	Per	own
1/30/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E6	GSM	M	33	0	0	0	-	Maint	Per	own
1/31/96	u/w	ISE	$147	D	Pac	CV	N	Act	E2	SA	M	20	0	0	0	3	Hsekp	Per	PPE
2/2/96	anch	upkp	$1,031	C	Pac	LHA	N	Act	E4	MS	M	20	1	0	1	14	Fdprp	Mat	n/a
2/3/96	u/w	ISE	$147	D	Lan	LPD	N	Act	E1	FR	M	20	0	0	0	2	Hsekp	Per	own
2/4/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	MS	M	21	0	0	0	16	Wtch	Per	oth
2/5/96	u/w	ISE	$460	C	Lan	FFG	N	Act	E2	FA	M	21	0	0	1	1	Maint	Per	both
2/5/96	u/w	ISE	$460	C	Pac	LHA	M	Act	E3	LCPL	M	19	0	0	1	-	Maint	Per	Tag
2/7/96	inpt	upkp	$147	D	Lan	LPD	N	Act	E1	MS	M	25	0	0	0	5	Hsekp	Per	own
2/9/96	u/w	ISE	$147	D	Pac	LSD	N	Act	E4	ET	M	21	0	0	0	3	PMS	Per	own
2/9/96	inpt	upkp	$147	D	Lan	CVN	N	Act	E1	DC	M	18	0	0	0	1	Maint	Per	own
2/9/96	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	DC	M	-	0	0	0	16	Maint	Per	own
2/13/96	u/w	ISE	$147	D	Lan	FFG	N	Act	E3	MS	M	20	0	0	0	22	Fdprp	Per	oth
2/14/96	u/w	ISE	$147	D	Pac	LHA	N	Act	E4	MM	M	21	0	0	0	10	T/S	Per	Tag
2/15/96	u/w	flops	$147	D	Pac	CVN	N	Act	E4	AO	M	22	0	0	0	36	Wtch	Per	own
2/15/96	yard	ovhl	$147	D	Pac	DDG	N	Act	E1	SR	F	19	0	0	0	3	Wtch	Per	oth
2/16/96	inpt	upkp	$147	D	Pac	DD	N	Act	E4	EM	M	25	0	0	0	6	Maint	Per	own
2/17/96	u/w	ISE	$147	D	Pac	LCC	N	Act	E4	OS	M	27	0	0	0	6	Weld	Per	PPE
2/19/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	21	0	0	0	1	Maint	Per	own
2/20/96	inpt	upkp	$147	D	Pac	LHA	N	Act	E4	AMH	M	-	0	0	0	24	T/S	Per	Tag
2/22/96	yard	ovhl	$147	D	Lan	AOE	N	Act	E4	BT	M	22	0	0	0	-	Wtch	Per	oth
2/23/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AT	M	35	0	0	0	18	Maint	Per	own
2/23/96	u/w	flops	$147	D	Pac	CVN	N	Act	E4	AT	M	23	0	0	0	18	T/S	Per	own
2/23/96	inpt	upkp	$920	C	Lan	MCM	N	Act	E6	EN	M	32	0	0	2	11	T/S	Per	own
2/26/96	inpt	upkp	$147	D	Lan	AS	N	Act	E4	EM	M	23	0	0	0	23	Maint	Per	Tag
2/28/96	u/w	ISE	$147	D	Lan	AS	N	Act	E4	IC	F	21	0	0	0	30	Maint	Per	oth
2/29/96	yard	ovhl	$147	D	Lan	FFG	N	Act	E6	SM	M	29	0	0	0	108	Train	Per	oth
3/1/96	u/w	ISE	$147	D	Lan	LHA	N	Act	E4	DC	M	20	0	0	0	24	Wtch	Mat	n/a
3/2/96	anch	upkp	$147	D	Pac	LST	N	Act	E6	BM	M	32	0	0	0	24	Wtch	Per	own
3/3/96	anch	upkp	$147	D	Lan	FFG	N	Act	E5	ET	M	24	0	0	0	72	T/S	unk	n/a
3/4/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E6	RM	M	32	0	0	0	156	Maint	Per	own
3/5/96	inpt	upkp	$147	D	Pac	CG	N	Act	E4	MS	M	25	0	0	0	36	Fdprp	Per	own
3/5/96	yard	ovhl	$147	D	Lan	MCM	N	Act	E5	MN	M	27	0	0	0	48	T/S	Per	Tag
3/6/96	inpt	upkp	$147	D	Pac	CV	N	Act	E4	MM	M	22	0	0	0	36	Maint	Per	oth
3/6/96	inpt	upkp	$147	D	Pac	CV	N	Act	E4	MM	M	21	0	0	0	24	Maint	Per	oth
3/7/96	u/w	flops	$147	D	Lan	CVN	N	Act	E3	AN	F	19	0	0	0	5	Wtch	Per	oth
3/7/96	u/w	flops	$147	D	Lan	CVN	N	Act	E4	ABH	M	21	0	0	0	30	Wtch	Per	own
3/8/96	inpt	upkp	$147	D	Lan	AS	N	Act	E4	MR	M	21	0	0	0	19	Hsekp	Mat	n/a
3/11/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E5	DC	M	20	0	0	0	47	Train	Per	oth
3/12/96	u/w	ISE	$147	D	Pac	CV	N	Act	E4	AT	M	21	0	0	0	12	Maint	Per	own
3/12/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	HM	M	23	0	0	0	35	Hsekp	Per	oth
3/13/96	inpt	upkp	$147	D	Pac	CG	N	Act	E4	GMM	M	25	0	0	0	4	Maint	Per	own
3/14/96	u/w	ISE	$147	D	Pac	FFG	N	Act	E4	EM	M	21	0	0	0	6	Maint	Per	own
3/14/96	u/w	ISE	$147	D	Lan	CG	N	Act	E5	MS	M	27	0	0	0	36	T/S	Per	both
3/18/96	u/w	ISE	$147	D	Pac	CV	N	Act	E4	ET	M	21	0	0	0	18	Maint	Per	Tag
3/19/96	yard	ovhl	$147	D	Pac	DD	N	Act	E4	CTR	M	22	0	0	0	10	Rehab	Per	oth

3/19/96	inpt	upkp	$147	D	Lan	DDG	N	Act	E5	FC	M	23	0	0	0	12	PMS	Per	PPE
3/21/96	u/w	ISE	$147	D	Lan	FFG	N	Act	E3	SN	M	21	0	0	0	8	Wtch	Per	oth
3/21/96	inpt	upkp	$147	D	Pac	AGF	N	Act	E4	MM	M	25	0	0	0	42	Maint	Per	Tag
3/22/96	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AT	M	25	0	0	0	5	Maint	Mat	n/a
3/25/96	inpt	upkp	$147	D	Lan	CG	N	Act	E4	FC	M	20	0	0	0	24	PMS	Per	own
3/26/96	inpt	upkp	$147	D	Pac	CG	N	Act	E5	GMM	M	26	0	0	0	-	Wtch	Per	oth
3/27/96	inpt	upkp	$147	D	Pac	CG	N	Act	E4	OS	M	22	0	0	0	24	Wtch	Per	own
3/27/96	inpt	upkp	$147	D	Lan	DD	N	Act	E4	IC	M	21	0	0	0	24	Hsekp	Per	PPE
3/30/96	inpt	upkp	$1,380	C	Lan	LCC	N	Act	E3	HT	M	20	0	2	2	23	Weld	Per	PPE
4/1/96	inpt	upkp	$147	D	Lan	AS	N	Act	E4	SH	F	23	0	0	0	-	Maint	Per	oth
4/1/96	u/w	flops	$147	D	Pac	CVN	N	Act	E2	AME	M	22	0	0	0	7	Maint	Per	oth
4/3/96	yard	ovhl	$147	D	Pac	AOE	N	Act	E3	SN	M	22	0	0	0	2	Wtch	Per	own
4/4/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	MM	M	23	0	0	0	40	Hsekp	Per	own
4/4/96	u/w	ISE	$147	D	Pac	T-AO	N	Act	E3	OS	M	21	0	0	0	-	Wtch	Per	oth
4/7/96	inpt	upkp	$147	D	Pac	CG	N	Act	E4	GMG	M	22	0	0	0	12	Wtch	Mat	n/a
4/7/96	inpt	upkp	$147	D	Lan	LPD	N	Act	E3	FN	M	23	0	0	0	12	T/S	Per	oth
4/8/96	inpt	upkp	$147	D	Lan	CV	N	Act	E5	AMH	M	28	0	0	0	-	Maint	Per	PPE
4/8/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E3	SN	M	20	0	0	0	24	Wtch	Per	own
4/8/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E4	IC	M	23	0	0	0	36	Wtch	Per	oth
4/10/96	u/w	ISE	$147	D	Lan	AS	N	Act	E3	HT	M	21	0	0	0	24	PMS	Mat	n/a
4/14/96	inpt	upkp	$147	D	Pac	AS	N	Act	E6	HT	M	29	0	0	0	22	Weld	Per	PPE
4/14/96	u/w	flops	$147	D	Pac	CVN	N	Act	E4	AMS	M	21	0	0	0	15	Maint	Per	own
4/14/96	u/w	flops	$147	D	Pac	CVN	N	Act	E3	AN	F	25	0	0	0	15	Wtch	Per	Tag
4/15/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AT	M	20	0	0	0	-	PMS	Per	own
4/16/96	inpt	upkp	$147	D	Lan	LCC	N	Act	E4	DS	M	23	0	0	0	12	PMS	Per	own
4/17/96	yard	ovhl	$147	D	Pac	CVN	N	Act	E3	FN	M	24	0	0	0	5	Maint	Per	oth
4/18/96	u/w	ISE	$1,031	C	Lan	DD	N	Act	E3	SN	M	20	1	0	1	17	Grind	Per	own
4/21/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E6	MM	M	30	0	0	0	120	Wtch	Per	own
4/23/96	inpt	upkp	$147	D	Lan	AGF	N	Act	E4	BM	M	22	0	0	0	32	Hsekp	Per	oth
4/23/96	inpt	upkp	$147	D	Pac	CV	N	Act	E5	MM	M	27	0	0	0	24	Hsekp	Mat	n/a
4/24/96	u/w	flops	$147	D	Lan	CVN	N	Act	E3	AN	M	20	0	0	0	7	Wtch	unk	n/a
4/25/96	inpt	upkp	$147	D	Lan	MCM	N	TAR	E6	ET	M	43	0	0	0	11	PMS	Per	own
4/25/96	u/w	ISE	$147	D	Lan	FFG	N	Act	E5	DC	M	21	0	0	0	49	PMS	Per	Tag
4/26/96	u/w	ISE	$1,031	C	Lan	DDG	N	Act	E3	SN	M	21	1	0	1	36	Hsekp	Per	oth
4/27/96	u/w	ISE	$147	D	Lan	CVN	M	Act	E3	LCPL	M	19	0	0	0	-	Wtch	Per	both
4/30/96	inpt	upkp	$147	D	Lan	CG	N	Act	E2	SA	M	20	0	0	0	6	Maint	Per	own
4/30/96	yard	ovhl	$460	C	Lan	DD	N	Act	E3	FN	M	20	0	0	1	24	Maint	Per	oth
5/1/96	u/w	ISE	$147	D	Pac	FFG	N	Act	E5	OS	M	26	0	0	0	12	Wtch	Per	own
5/2/96	u/w	ISE	$147	D	Lan	DD	N	Act	E4	EM	M	24	0	0	0	48	Maint	Per	own
5/2/96	u/w	ISE	$147	D	Lan	DD	N	Act	E3	EM	M	21	0	0	0	18	Maint	Per	own
5/4/96	u/w	ISE	$147	D	Lan	CV	N	Act	E5	DS	M	36	0	0	0	23	Maint	Per	PPE
5/5/96	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AT	M	20	0	0	0	-	Maint	Per	PPE
5/5/96	u/w	ISE	$147	D	Lan	DD	N	Act	E5	DS	M	26	0	0	0	48	T/S	Per	PPE
5/6/96	yard	ovhl	$147	D	Lan	LPH	N	Act	E5	OS	M	23	0	0	0	-	T/S	Per	Tag
5/7/96	inpt	upkp	$147	D	Lan	MCM	N	Act	E5	ET	M	30	0	0	0	30	Maint	Per	own
5/7/96	inpt	upkp	$147	D	Lan	AS	N	Act	E1	SR	F	19	0	0	0	-	Wtch	Per	own
5/13/96	inpt	upkp	$147	D	Pac	FFG	N	Act	E2	SM	M	20	0	0	0	6	Maint	Per	own
5/15/96	inpt	upkp	$147	D	Pac	CV	N	Act	E4	AK	M	-	0	0	0	42	Maint	Per	PPE
5/20/96	inpt	upkp	$147	D	Lan	AD	N	Act	E5	ET	F	28	0	0	0	84	Maint	Per	PPE
5/20/96	u/w	ISE	$147	D	Pac	FFG	N	Act	E4	GMM	M	22	0	0	0	47	Maint	Per	own

5/20/96	inpt	upkp	$147	D	Lan	AOE	N	Act	E3	FN	M	21	0	0	0	12	Maint	Per	Tag
5/20/96	inpt	upkp	$147	D	Lan	DD	N	Act	E4	HT	M	26	0	0	0	14	Weld	Per	PPE
5/22/96	u/w	ISE	$690	C	Lan	CVN	N	Act	E4	IC	M	22	0	1	1	27	T/S	Per	own
5/23/96	inpt	upkp	$147	D	Lan	AS	N	Act	E3	SN	F	24	0	0	0	4	Maint	Mat	n/a
5/24/96	u/w	s/a	$147	D	Pac	FFG	N	Act	E4	OS	M	23	0	0	0	31	Wtch	Per	oth
5/24/96	u/w	s/a	$147	D	Lan	MHC	N	Act	E3	SN	M	21	0	0	0	6	Wtch	Mat	n/a
5/24/96	yard	ovhl	$147	D	Pac	LHD	N	Act	E6	IC	M	41	0	0	0	144	T/S	Mat	n/a
5/26/96	u/w	ISE	$147	D	Lan	CG	N	Act	E3	OS	M	20	0	0	0	3	Wtch	Per	oth
5/29/96	inpt	upkp	$147	D	Pac	LPD	N	Act	E5	MS	M	37	0	0	0	7	Fdprp	Mat	n/a
5/29/96	inpt	upkp	$147	D	Pac	LSD	N	Act	E5	EM	M	31	0	0	0	12	T/S	Per	own
5/30/96	u/w	ISE	$147	D	Pac	LHD	N	Act	E4	MM	M	21	0	0	0	24	Maint	Mat	n/a
5/30/96	yard	ovhl	$147	D	Lan	CVN	N	Act	O2	LTjg	F	24	0	0	0	24	T/S	Per	oth
5/30/96	inpt	upkp	$147	D	Pac	LPD	N	Act	E3	BM	M	25	0	0	0	42	Wtch	Per	own
5/31/96	u/w	ISE	$147	D	Pac	CV	N	Act	E5	AT	M	29	0	0	0	18	PMS	Per	own
5/31/96	inpt	upkp	$147	D	Pac	LPD	N	Act	E5	HT	M	26	0	0	0	32	Weld	Per	PPE
6/3/96	u/w	ISE	$147	D	Pac	CV	N	Act	E5	AT	M	27	0	0	0	10	Maint	Per	oth
6/3/96	yard	upkp	$147	D	Lan	DD	N	Act	E4	FC	M	23	0	0	0	12	PMS	Mat	n/a
6/3/96	inpt	upkp	$147	D	Lan	AOE	N	Act	E6	BM	M	32	0	0	0	-	Wtch	Mat	n/a
6/4/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E2	AE	M	21	0	0	0	3	Maint	Per	own
6/5/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E5	EM	M	24	0	0	0	36	Inspt	Mat	n/a
6/7/96	yard	ovhl	$460	C	Lan	DD	N	Act	E4	FC	M	24	0	0	1	49	Wtch	Per	oth
6/9/96	inpt	upkp	$147	D	Lan	CVN	N	Act	E6	HM	M	39	0	0	0	12	Wtch	Per	own
6/10/96	anch	upkp	$147	D	Pac	CVN	N	Act	E5	QM	M	36	0	0	0	24	Wtch	Per	own
6/11/96	u/w	ISE	$460	C	Pac	LPD	N	Act	E5	BM	M	31	0	0	1	48	Weld	Per	PPE
6/12/96	yard	ovhl	$147	D	Lan	CGN	N	Act	O2	LTjg	M	25	0	0	0	8	Wtch	Mat	n/a
6/13/96	u/w	ISE	$147	D	Pac	CGN	N	Act	E6	MM	M	-	0	0	0	60	Wtch	Per	own
6/13/96	inpt	upkp	$147	D	Pac	CV	N	Act	E4	AT	M	-	0	0	0	60	Maint	Per	own
6/15/96	u/w	ISE	$147	D	Lan	LPD	N	Act	E1	FR	M	19	0	0	0	18	Rehab	Per	Tag
6/22/96	u/w	ISE	$147	D	Pac	CGN	N	Act	E5	MM	M	30	0	0	0	36	PMS	Mat	n/a
6/23/96	inpt	upkp	$147	D	Lan	AS	N	Act	E3	MS	F	21	0	0	0	13	Fdprp	Per	own
6/24/96	u/w	ISE	$147	D	Lan	LPH	M	Act	E4	CPL	M	26	0	0	0	42	Maint	Per	own
6/25/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	MM	M	21	0	0	0	36	Wtch	Per	own
6/27/96	inpt	upkp	$147	D	Pac	LPH	N	Act	E4	BT	M	22	0	0	0	24	Maint	Per	own
6/29/96	u/w	ISE	$147	D	Pac	CGN	N	Act	E6	MM	M	31	0	0	0	9	Maint	Per	oth
7/2/96	u/w	ISE	$147	D	Pac	LPD	N	Act	E2	FA	M	21	0	0	0	15	Maint	Per	Tag
7/3/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AE	M	20	0	0	0	7	Maint	Per	own
7/5/96	u/w	ISE	$147	D	Pac	CGN	N	Act	E1	QM	M	18	0	0	0	3	Wtch	Per	oth
7/6/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	22	0	0	0	12	T/S	Per	own
7/7/96	yard	ovhl	$230	D	Pac	AOE	N	Act	E4	EN	M	22	0	1	0	26	Maint	Per	Tag
7/10/96	inpt	upkp	$147	D	Pac	LSD	N	Act	E4	HT	M	22	0	0	0	-	Weld	Per	PPE
7/11/96	inpt	upkp	$147	D	Lan	AS	N	Act	E4	MR	M	20	0	0	0	21	Wtch	Per	Tag
7/15/96	u/w	ISE	$147	D	Pac	DDG	N	Act	E1	SR	M	23	0	0	0	2	Hsekp	Mat	n/a
7/16/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	MM	M	-	0	0	0	20	Maint	Per	own
7/17/96	u/w	ISE	$147	D	Pac	LHA	N	Act	E3	EM	M	31	0	0	0	11	Maint	Per	Tag
7/17/96	inpt	upkp	$147	D	Lan	CGN	N	Act	E4	MM	M	23	0	0	0	32	Wtch	Per	both
7/21/96	u/w	flops	$147	D	Lan	CVN	N	Act	E4	ABH	M	23	0	0	0	26	Wtch	Mat	n/a
7/23/96	yard	ovhl	$920	C	Pac	CVN	N	Act	E5	AW	M	21	0	0	2	36	Weld	Per	PPE
7/24/96	yard	ovhl	$147	D	Pac	CVN	N	Act	E4	QM	F	22	0	0	0	9	Hsekp	Per	own
7/25/96	inpt	upkp	$147	D	Pac	CG	N	Act	E4	GSM	M	22	0	0	0	14	Hsekp	Per	own
7/28/96	inpt	upkp	$147	D	Lan	LSD	N	Act	E3	QM	M	21	0	0	0	-	Wtch	Per	own

7/30/96	inpt	upkp	$460	C	Pac	CG	N	Act	E5	EM	M	28	0	0	1	60	T/S	Per	Tag
7/30/96	inpt	upkp	$147	D	Lan	AS	N	Act	E4	ET	M	23	0	0	0	48	Maint	Per	own
8/1/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	AT	M	24	0	0	0	48	T/S	Per	own
8/1/96	inpt	upkp	$147	D	Lan	DD	N	Act	E4	EM	M	23	0	0	0	30	Maint	Per	own
8/1/96	inpt	upkp	$147	D	Lan	AS	N	Act	E6	HM	M	34	0	0	0	10	Maint	Per	own
8/5/96	inpt	upkp	$147	D	Pac	CG	N	Act	E3	EM	M	25	0	0	0	14	PMS	Per	PPE
8/8/96	yard	upkp	$147	D	Lan	DD	N	Act	E6	ET	M	35	0	0	0	60	Maint	Per	oth
8/8/96	inpt	upkp	$147	D	Pac	FFG	N	Act	E5	EM	M	31	0	0	0	8	PMS	Per	oth
8/8/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	IC	M	25	0	0	0	4	T/S	Per	Tag
8/8/96	inpt	upkp	$147	D	Pac	AS	N	Act	E5	ET	M	27	0	0	0	144	Maint	Per	oth
8/8/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AT	M	21	0	0	0	36	T/S	Per	oth
8/12/96	inpt	upkp	$147	D	Pac	AE	N	Act	E4	QM	M	24	0	0	0	26	Maint	Per	oth
8/12/96	inpt	upkp	$147	D	Pac	AE	N	Act	E4	ET	M	21	0	0	0	9	T/S	Per	PPE
8/12/96	anch	upkp	$147	D	Pac	LHA	N	Act	E5	ET	M	27	0	0	0	66	T/S	Per	PPE
8/12/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E2	EM	M	20	0	0	0	-	Weld	Per	PPE
8/12/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E5	GSE	M	23	0	0	0	36	PMS	Mat	n/a
8/12/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	AT	M	30	0	0	0	21	Maint	Mat	n/a
8/14/96	inpt	upkp	$1,380	C	Pac	FFG	N	Act	E7	SK	M	35	0	2	2	192	Wtch	Per	own
8/17/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	23	0	0	0	36	Maint	Per	own
8/21/96	u/w	ISE	$147	D	Pac	DDG	N	Act	E3	OS	M	20	0	0	0	2	Wtch	Mat	n/a
8/21/96	u/w	ISE	$147	D	Pac	DDG	N	Act	E4	OS	M	22	0	0	0	42	Wtch	Per	own
8/21/96	yard	ovhl	$147	D	Lan	DDG	N	Act	O3	LT	M	24	0	0	0	24	Wtch	Per	oth
8/22/96	anch	upkp	$147	D	Lan	LSD	N	Act	E6	MS	M	-	0	0	0	0	Hsekp	Per	oth
8/22/96	yard	ovhl	$147	D	Lan	DDG	N	Act	E4	STG	M	23	0	0	0	10	Hsekp	Per	oth
8/23/96	inpt	upkp	$147	D	Pac	CGN	N	Act	E2	QM	M	20	0	0	0	3	Maint	Per	own
8/23/96	u/w	ISE	$147	D	Lan	AS	N	Act	E3	SN	M	20	0	0	0	23	Wtch	Per	oth
8/28/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	EM	M	24	0	0	0	13	PMS	Per	PPE
8/28/96	u/w	flops	$147	D	Lan	CVN	N	Act	E2	AE	M	23	0	0	0	3	Maint	Per	own
8/28/96	u/w	ISE	$147	D	Lan	AS	N	Act	E3	BM	M	23	0	0	0	22	Wtch	Per	oth
8/29/96	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	BM	M	25	0	0	0	24	Rehab	Per	Tag
9/1/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	AS	M	22	0	0	0	8	PMS	Per	PPE
9/2/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E6	MM	M	27	0	0	0	12	Hsekp	Per	own
9/3/96	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AT	M	23	0	0	0	32	Maint	Per	PPE
9/9/96	inpt	upkp	$147	D	Pac	LHA	N	Act	E9	DC	M	36	0	0	0	216	Maint	Per	own
9/9/96	inpt	upkp	$147	D	Lan	LPH	N	Act	E6	AMS	M	41	0	0	0	120	Weld	Per	own
9/10/96	drydk	upkp	$147	D	Lan	DD	N	Act	E5	HT	M	22	0	0	0	46	Weld	Per	PPE
9/11/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AE	M	29	0	0	0	36	Maint	Per	own
9/11/96	drydk	upkp	$147	D	Lan	DD	N	Act	E3	MS	M	19	0	0	0	1	Grind	Per	own
9/12/96	inpt	upkp	$147	D	Pac	LHA	N	Act	E5	BM	M	27	0	0	0	-	Maint	Per	PPE
9/13/96	inpt	upkp	$147	D	Pac	CGN	N	Act	E4	RM	M	24	0	0	0	48	Wtch	Mat	n/a
9/13/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	IC	M	26	0	0	0	18	DC	Per	own
9/13/96	u/w	ISE	$147	D	Pac	LHD	N	Act	E3	HT	M	23	0	0	0	32	Weld	Per	PPE
9/16/96	u/w	ISE	$147	D	Lan	DDG	N	Act	E3	MS	M	21	0	0	0	16	Fdprp	Per	own
9/17/96	inpt	upkp	$230	D	Lan	AO	N	Act	E4	EM	F	23	0	1	0	36	T/S	Per	oth
9/17/96	inpt	upkp	$147	D	Lan	LPD	N	Act	E4	BM	M	23	0	0	0	12	PMS	unk	n/a
9/22/96	u/w	ISE	$147	D	Lan	FFG	N	Act	E4	BM	M	23	0	0	0	42	Maint	Per	oth
9/23/96	inpt	upkp	$1,031	C	Pac	LHA	N	Act	E4	MM	M	22	1	0	1	48	Maint	Per	PPE
9/23/96	inpt	upkp	$147	D	Lan	AS	N	Act	E3	FN	M	20	0	0	0	15	T/S	Per	PPE
9/23/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E3	MM	F	27	0	0	0	24	PMS	Per	own
9/24/96	u/w	ISE	$147	D	Pac	LHA	N	Act	E3	FN	M	20	0	0	0	15	Wtch	Mat	n/a

Date	Loc	Act	Cost	D/C	Flt	Ship	N	Act	Rate	Rating	Sex	Age				Num	Task	Per/Mat	Type
9/25/96	inpt	upkp	$147	D	Pac	CV	N	Act	E2	AO	M	19	0	0	0	9	Hsekp	Per	Tag
9/25/96	u/w	ISE	$147	D	Lan	LCC	N	Act	E3	HT	M	20	0	0	0	6	Weld	Per	PPE
9/25/96	u/w	ISE	$147	D	Pac	CV	N	Act	E2	AO	M	19	0	0	0	6	T/S	Per	Tag
9/26/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	EM	M	27	0	0	0	36	Maint	Per	own
9/26/96	inpt	upkp	$147	D	Pac	LHA	N	Act	E3	FN	M	20	0	0	0	1	Hsekp	Per	own
9/29/96	yard	upkp	$147	D	Lan	DD	N	Act	E2	RM	M	21	0	0	0	40	Wtch	Per	oth
9/30/96	inpt	upkp	$147	D	Pac	CG	N	Act	E4	GSM	M	25	0	0	0	12	PMS	Per	oth
10/1/96	drydk	conv	$147	D	Lan	CVN	N	Act	E6	ABF	M	37	0	0	0	232	Maint	Per	own
10/1/96	u/w	flops	$147	D	Lan	CVN	N	Act	E5	AS	M	24	0	0	0	82	T/S	Per	own
10/4/96	yard	ovhl	$690	C	Pac	CVN	N	Act	E5	DS	M	25	0	1	1	42	Maint	Per	own
10/5/96	u/w	ISE	$147	D	Pac	LPD	N	Act	E4	OS	M	-	0	0	0	12	Maint	Per	Tag
10/5/96	u/w	ISE	$147	D	Pac	LPD	N	Act	E3	OS	M	-	0	0	0	18	Maint	Per	Tag
10/7/96	inpt	upkp	$147	D	Lan	AS	N	Act	E2	EM	F	21	0	0	0	23	Wtch	Mat	n/a
10/8/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E5	AO	M	30	0	0	0	2	Weld	Per	own
10/8/96	inpt	upkp	$147	D	Lan	AE	N	Act	E5	BM	M	27	0	0	0	18	Wtch	unk	n/a
10/9/96	yard	ovhl	$147	D	Lan	CG	N	Act	E4	EW	M	21	0	0	0	36	Hsekp	Per	own
10/12/96	u/w	ISE	$147	D	Lan	AOE	N	Act	E4	MS	M	23	0	0	0	35	Hsekp	Per	own
10/14/96	u/w	flops	$147	D	Lan	CVN	N	Act	E2	AA	M	21	0	0	0	6	Wtch	Per	oth
10/14/96	inpt	upkp	$147	D	Pac	CV	N	Act	E5	AT	M	25	0	0	0	30	Maint	Per	own
10/16/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E3	SM	M	21	0	0	0	15	Hsekp	Per	own
10/21/96	u/w	flops	$147	D	Lan	CVN	N	Act	E2	AA	M	19	0	0	0	6	Wtch	Per	own
10/21/96	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AT	M	26	0	0	0	16	T/S	Per	own
10/22/96	inpt	upkp	$147	D	Lan	CG	N	Act	E7	BM	M	36	0	0	0	120	Wtch	Per	oth
10/22/96	u/w	flops	$147	D	Pac	CG	N	Act	O3	LT	M	31	0	0	0	42	Wtch	Mat	n/a
10/23/96	u/w	ISE	$147	D	Lan	DDG	N	Act	E3	GMM	M	22	0	0	0	7	Maint	Per	own
10/23/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	AS	M	21	0	0	0	5	Maint	Per	Tag
10/24/96	inpt	upkp	$147	D	Pac	DD	N	Act	E3	FN	M	19	0	0	0	24	PMS	Per	Tag
10/25/96	u/w	flops	$147	D	Pac	CG	N	Act	E6	EN	M	39	0	0	0	42	Wtch	Mat	n/a
10/25/96	yard	ovhl	$147	D	Lan	DDG	N	Act	E5	FC	M	33	0	0	0	84	Hsekp	Per	own
10/25/96	u/w	flops	$147	D	Lan	CVN	N	Act	E3	AN	M	24	0	0	0	18	Wtch	Mat	n/a
10/25/96	yard	upkp	$147	D	Pac	DDG	N	Act	E4	GMM	F	20	0	0	0	9	Maint	Per	Tag
10/25/96	inpt	upkp	$147	D	Pac	FFG	N	Act	E6	HT	M	-	0	0	0	120	Weld	Per	PPE
10/26/96	u/w	ISE	$147	D	Pac	CV	N	Act	E3	EM	M	19	0	0	0	4	Maint	Per	own
10/28/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E8	GS	M	35	0	0	0	120	Maint	Per	own
10/28/96	inpt	upkp	$147	D	Pac	LSD	N	Act	E5	HT	M	30	0	0	0	120	Weld	Per	PPE
10/29/96	inpt	upkp	$147	D	Lan	DD	N	Act	E4	EM	M	20	0	0	0	5	Maint	Per	oth
10/30/96	u/w	ISE	$147	D	Pac	CV	N	Act	E5	AT	M	29	0	0	0	72	Maint	Per	own
10/30/96	inpt	upkp	$147	D	Lan	AS	N	Act	E2	MS	M	21	0	0	0	4	T/S	Per	own
10/31/96	u/w	ISE	$147	D	Pac	DDG	N	Act	E5	FC	M	27	0	0	0	12	T/S	Per	oth
11/1/96	inpt	upkp	$147	D	Lan	DD	N	Act	E3	SN	M	24	0	0	0	-	Wtch	Per	own
11/4/96	u/w	ISE	$147	D	Pac	AOE	N	Act	E5	EM	M	26	0	0	0	25	T/S	Per	Tag
11/4/96	anch	upkp	$1,380	C	Lan	FFG	N	Act	E2	RM	M	21	0	2	2	9	Maint	unk	n/a
11/6/96	inpt	upkp	$460	C	Lan	CG	N	Act	E4	SM	M	22	0	0	1	24	Wtch	Per	oth
11/6/96	inpt	upkp	$147	D	Lan	AS	N	Act	E2	MR	M	19	0	0	0	11	Maint	Per	own
11/9/96	inpt	upkp	$147	D	Lan	CVN	N	Act	E4	EM	M	24	0	0	0	36	PMS	Per	Tag
11/12/96	yard	ovhl	$147	D	Pac	CVN	N	Act	E5	DC	M	30	0	0	0	96	DC	Per	PPE
11/13/96	inpt	upkp	$147	D	Pac	LPH	N	Act	E3	EM	M	22	0	0	0	21	Maint	Per	Tag
11/15/96	inpt	upkp	$147	D	Lan	DDG	N	Act	E5	FC	M	25	0	0	0	36	Maint	Per	own
11/16/96	u/w	flops	$147	D	Lan	CV	N	Act	E3	AN	M	21	0	0	0	10	Wtch	Per	own
11/18/96	inpt	upkp	$147	D	Lan	LSD	N	Act	E3	FN	M	27	0	0	0	16	T/S	Per	Tag

11/19/96	inpt	upkp	$147	D	Lan	ARS	N	Act	E3	EN	M	21	0	0	0	6	Maint	Per	oth
11/19/96	u/w	ISE	$690	C	Lan	CG	N	Act	E4	TM	M	20	0	1	1	2	Hsekp	Per	Tag
11/20/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	MM	M	23	0	0	0	36	Maint	Per	own
11/22/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	EM	M	23	0	0	0	25	T/S	Per	PPE
11/23/96	u/w	flops	$147	D	Lan	CVN	N	Act	E5	AMH	M	26	0	0	0	6	Wtch	unk	n/a
11/25/96	inpt	upkp	$147	D	Lan	LPD	N	Act	E4	EN	M	25	0	0	0	7	Wtch	Per	oth
11/25/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	HT	M	22	0	0	0	24	Maint	Per	oth
11/28/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E2	AA	M	26	0	0	0	1	Dishes	Per	oth
11/28/96	u/w	ISE	$147	D	Pac	CV	N	Act	E4	HT	M	25	0	0	0	54	Weld	Per	PPE
12/3/96	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	RM	M	25	0	0	0	-	Wtch	Per	PPE
12/4/96	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	MM	M	22	0	0	0	-	Wtch	Per	own
12/5/96	inpt	upkp	$147	D	Pac	CV	N	Act	E1	AO	M	19	0	0	0	3	Wtch	Per	own
12/8/96	inpt	upkp	$147	D	Pac	DD	N	Act	E3	SN	M	24	0	0	0	16	Maint	Per	Tag
12/9/96	inpt	upkp	$147	D	Pac	DD	N	Act	E7	OS	M	38	0	0	0	240	Wtch	Per	Tag
12/15/96	inpt	upkp	$147	D	Pac	CG	N	Act	E3	SN	M	21	0	0	0	18	Wtch	Mat	n/a
12/19/96	inpt	upkp	$147	D	Lan	FFG	N	Act	E2	EM	M	-	0	0	0	1	PMS	Per	Tag
12/20/96	inpt	upkp	$147	D	Pac	LPD	N	TAR	O1	ENS	M	27	0	0	0	0	Inspt	Per	PPE
12/20/96	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	EM	M	21	0	0	0	36	T/S	Per	Tag
1/2/97	inpt	upkp	$147	D	Pac	CV	N	Act	E3	MS	M	21	0	0	0	4	T/S	Per	own
1/2/97	inpt	ISE	$147	D	Lan	DD	N	Act	E4	SK	M	23	0	0	0	31	Hsekp	Per	own
1/3/97	inpt	upkp	$147	D	Lan	FFG	N	Act	E2	GSE	M	20	0	0	0	2	PMS	Per	both
1/4/97	inpt	upkp	$147	D	Pac	AS	N	Act	E4	MS	F	21	0	0	0	42	Fdprp	Mat	n/a
1/5/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E3	MS	M	21	0	0	0	11	Fdprp	Per	own
1/6/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	MM	M	22	0	0	0	3	Hsekp	Per	own
1/8/97	inpt	upkp	$460	C	Lan	FFG	N	Act	E4	MS	M	23	0	0	1	11	Fdprp	Unk	n/a
1/8/97	yard	ovhl	$147	D	Lan	FFG	N	Act	E4	GSE	M	21	0	0	0	32	PMS	Per	own
1/11/97	u/w	ISE	$147	D	Pac	LCC	N	Act	E4	HT	M	27	0	0	0	36	Weld	Per	PPE
1/13/97	yard	ovhl	$147	D	Lan	LSD	N	Act	E4	RM	M	23	0	0	0	1	Rehab	Per	Tag
1/13/97	inpt	upkp	$147	D	Pac	CVN	N	Act	E5	AO	M	24	0	0	0	53	PMS	Per	own
1/13/97	drydk	ovhl	$147	D	Pac	LHA	N	Act	E2	FA	M	20	0	0	0	7	Wtch	Per	Tag
1/13/97	u/w	ISE	$147	D	Lan	MCS	N	Act	E4	AT	M	24	0	0	0	8	Maint	Per	own
1/14/97	inpt	upkp	$147	D	Lan	DD	N	Act	E3	RM	M	20	0	0	0	5	Wtch	Per	oth
1/18/97	u/w	ISE	$147	D	Lan	DD	N	Act	E4	SH	M	25	0	0	0	32	Lndry	Per	Tag
1/19/97	u/w	ISE	$147	D	Pac	CV	N	Act	E5	AT	M	23	0	0	0	48	T/S	Per	own
1/22/97	inpt	upkp	$147	D	Lan	PC	N	Act	E5	GMG	M	27	0	0	0	36	PMS	Mat	n/a
1/23/97	inpt	upkp	$147	D	Lan	DD	N	Act	E1	FR	M	19	0	0	0	1	T/S	Per	Tag
1/24/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E2	AT	M	20	0	0	0	15	Hsekp	Per	oth
1/24/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	ABH	M	25	0	0	0	-	Hsekp	Per	own
1/24/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E5	ABH	M	21	0	0	0	-	T/S	Per	own
1/24/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E5	ABH	M	25	0	0	0	-	T/S	Per	own
1/24/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E3	EM	M	20	0	0	0	-	T/S	Per	Tag
1/24/97	inpt	upkp	$147	D	Lan	DD	N	Act	E5	DC	M	25	0	0	0	60	Maint	Per	PPE
1/27/97	inpt	upkp	$147	D	Lan	CG	N	Act	O3	LT	M	37	0	0	0	-	Wtch	Per	oth
1/27/97	inpt	upkp	$147	D	Lan	AS	N	Act	E4	BT	M	23	0	0	0	144	Maint	Per	both
1/30/97	inpt	upkp	$147	D	Lan	FFG	N	Act	E4	EM	M	26	0	0	0	30	Maint	Per	oth
1/31/97	u/w	ISE	$147	D	Pac	FFG	N	Act	O2	LTjg	M	31	0	0	0	-	T/S	Per	PPE
1/31/97	u/w	ISE	$147	D	Pac	FFG	N	Act	E5	GSM	M	29	0	0	0	7	T/S	Per	PPE
2/3/97	u/w	ISE	$147	D	Pac	CV	N	Act	E2	SA	M	21	0	0	0	4	Weld	Per	oth
2/3/97	inpt	upkp	$147	D	Lan	DD	N	Act	E4	HT	M	22	0	0	0	12	Weld	Per	PPE
2/4/97	u/w	ISE	$230	D	Pac	CVN	N	Act	E5	OS	M	23	0	1	0	2	Wtch	Per	oth

Date	Loc	Type	Cost		Fleet	Class	N	Act	Rank	Rate	Sex	Age					Cat		
2/5/97	u/w	ISE	$147	D	Pac	AE	N	Act	E2	RM	F	20	0	0	0	5	PMS	Per	oth
2/6/97	inpt	upkp	$147	D	Lan	AOE	N	Act	E3	IC	M	22	0	0	0	33	Maint	Per	PPE
2/6/97	inpt	upkp	$147	D	Pac	CG	N	Act	E6	FC	M	34	0	0	0	-	Hsekp	Per	own
2/7/97	u/w	ISE	$147	D	Pac	DDG	N	Act	E5	IC	M	30	0	0	0	84	T/S	Per	Tag
2/11/97	u/w	ISE	$147	D	Pac	AO	N	Act	E5	MM	M	40	0	0	0	6	Wtch	Per	oth
2/12/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E5	MM	M	31	0	0	0	6	T/S	Mat	n/a
2/13/97	inpt	upkp	$147	D	Lan	AGF	N	Act	E2	MM	M	19	0	0	0	5	PMS	Per	Tag
2/14/97	inpt	upkp	$147	D	Pac	DDG	N	Act	O3	LT	M	30	0	0	0	-	Inspt	Per	PPE
2/15/97	yard	ovhl	$147	D	Lan	DD	N	Act	E2	FA	M	19	0	0	0	11	Rehab	Per	PPE
2/18/97	inpt	upkp	$147	D	Pac	AO	N	Act	E4	IC	M	24	0	0	0	15	Maint	Per	PPE
2/20/97	inpt	upkp	$147	D	Lan	DD	N	Act	E4	OS	M	24	0	0	0	33	PMS	Per	Tag
2/20/97	yard	ovhl	$147	D	Lan	CG	N	Act	E2	FA	M	19	0	0	0	9	Maint	Per	oth
2/20/97	inpt	upkp	$147	D	Lan	LSD	N	Act	E4	HT	M	21	0	0	0	24	Weld	Per	PPE
2/20/97	u/w	ISE	$147	D	Pac	CV	N	Act	WO2	CWO	M	34	0	0	0	72	Inspt	Per	oth
2/21/97	inpt	upkp	$147	D	Lan	DD	N	Act	O3	LT	M	33	0	0	0	23	Inspt	Per	PPE
2/22/97	inpt	upkp	$147	D	Lan	CG	N	Act	O4	LCDR	M	33	0	0	0	15	Wtch	Per	oth
2/22/97	u/w	ISE	$147	D	Pac	AS	N	Act	E5	OM	M	40	0	0	0	180	Train	Mat	n/a
2/23/97	yard	upkp	$147	D	Pac	CGN	N	Act	E7	HT	M	32	0	0	0	168	DC	Per	own
2/23/97	yard	upkp	$147	D	Pac	CGN	N	Act	E6	MM	M	29	0	0	0	60	DC	Per	own
2/24/97	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	DK	M	36	0	0	0	156	Maint	Per	both
2/24/97	u/w	ISE	$147	D	Pac	DD	N	Act	O2	LTjg	M	26	0	0	0	1	Wtch	Per	own
2/24/97	u/w	ISE	$147	D	Pac	CG	N	Act	E5	EN	M	25	0	0	0	36	Maint	Mat	n/a
2/24/97	u/w	ISE	$147	D	Pac	DD	N	Act	E4	DC	M	21	0	0	0	36	Wtch	Per	own
2/25/97	u/w	ISE	$147	D	Pac	CV	N	Act	E2	AK	M	21	0	0	0	-	Wtch	Per	own
2/26/97	yard	ovhl	$460	C	Lan	DD	N	Act	E3	GMG	M	19	0	0	1	1	Hsekp	Per	Tag
2/26/97	inpt	upkp	$147	D	Lan	DD	N	Act	E6	TM	M	35	0	0	0	72	T/S	Per	own
2/28/97	yard	ovhl	$147	D	Pac	AOE	N	Act	E5	EM	M	25	0	0	0	48	PMS	Per	Tag
2/28/97	inpt	upkp	$147	D	Pac	LSD	N	Act	E4	EM	M	20	0	0	0	12	Maint	Per	both
3/1/97	u/w	s/a	$147	D	Pac	DD	N	Act	E5	BM	M	26	0	0	0	60	Wtch	Per	oth
3/3/97	u/w	ISE	$147	D	Lan	CG	N	Act	E3	SH	M	21	0	0	0	5	Maint	Per	own
3/3/97	inpt	s/a	$147	D	Lan	LPD	N	Act	E3	SN	M	22	0	0	0	24	Wtch	Per	own
3/3/97	inpt	upkp	$147	D	Lan	LCC	N	Act	E5	DS	M	24	0	0	0	60	Maint	Per	oth
3/3/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	MS	M	21	0	0	0	24	Rehab	Per	oth
3/5/97	u/w	ISE	$147	D	Pac	LSD	N	Act	E3	MS	F	23	0	0	0	3	Hsekp	Mat	n/a
3/7/97	inpt	upkp	$147	D	Lan	CG	N	Act	E4	FC	M	24	0	0	0	26	PMS	unk	n/a
3/9/97	u/w	flops	$147	D	Lan	CV	N	Act	E4	AE	M	23	0	0	0	12	Maint	Per	Tag
3/11/97	yard	ovhl	$147	D	Lan	FFG	N	Act	O1	ENS	M	22	0	0	0	-	T/S	Per	Tag
3/12/97	drydk	upkp	$460	C	Lan	AFDM	N	Act	E4	HT	M	24	0	0	1	36	Weld	Per	PPE
3/12/97	yard	upkp	$147	D	Pac	CGN	N	Act	E4	GMG	M	23	0	0	0	48	Maint	Per	own
3/12/97	yard	ovhl	$147	D	Lan	FFG	N	Act	E4	GSE	M	28	0	0	0	80	Maint	Per	own
3/13/97	inpt	upkp	$2,062	C	Lan	DDG	N	Act	E4	RM	M	23	2	0	2	36	PMS	Per	both
3/15/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AN	M	20	0	0	0	-	Hsekp	Per	Tag
3/16/97	u/w	flops	$147	D	Pac	DD	N	Act	O2	LTjg	M	31	0	0	0	2	Wtch	Per	own
3/17/97	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AT	M	20	0	0	0	18	PMS	Per	PPE
3/18/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E3	HT	M	20	0	0	0	12	Weld	Per	own
3/18/97	u/w	ISE	$147	D	Lan	DD	N	Act	E5	QM	M	27	0	0	0	42	Wtch	unk	n/a
3/18/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	EN	M	-	0	0	0	24	Maint	Per	own
3/19/97	yard	upkp	$147	D	Lan	CVN	N	Act	E3	SK	M	20	0	0	0	1	Hsekp	Per	own
3/19/97	u/w	ISE	$147	D	Pac	LHD	N	Act	E4	ET	M	24	0	0	0	24	T/S	Per	own
3/20/97	u/w	ISE	$147	D	Pac	LSD	N	Act	E4	ET	M	21	0	0	0	10	T/S	Per	own

3/26/97	inpt	upkp	$147	D	Lan	CG	N	Act	E4	MS	M	23	0	0	0	6	Hsekp	Per	Tag
3/26/97	u/w	ISE	$147	D	Pac	FFG	N	Act	E4	TM	M	21	0	0	0	-	Hsekp	Per	Tag
3/28/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E3	GSE	M	23	0	0	0	12	PMS	Per	Tag
3/31/97	inpt	upkp	$147	D	Pac	LPD	N	Act	E4	EN	M	27	0	0	0	12	Maint	Mat	n/a
3/31/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E6	DC	M	38	0	0	0	48	Train	Per	own
4/1/97	u/w	ISE	$147	D	Pac	DD	N	Act	E4	GMG	M	21	0	0	0	30	Maint	Per	PPE
4/3/97	inpt	upkp	$147	D	Pac	CVN	N	Act	E5	EM	M	25	0	0	0	36	Maint	Per	Tag
4/4/97	inpt	upkp	$147	D	Pac	CVN	N	Act	E2	MS	M	20	0	0	0	20	Maint	Mat	n/a
4/4/97	inpt	upkp	$1,031	C	Pac	ARS	N	Act	E3	EM	M	21	1	0	1	16	T/S	Per	PPE
4/7/97	u/w	ISE	$147	D	Lan	MHC	N	Act	E7	BM	M	34	0	0	0	120	Wtch	Mat	n/a
4/7/97	u/w	ISE	$147	D	Lan	MHC	N	Act	E5	BM	M	22	0	0	0	48	Wtch	Per	own
4/7/97	u/w	ISE	$147	D	Lan	MHC	N	Act	E4	EN	M	20	0	0	0	7	Wtch	Per	own
4/8/97	inpt	upkp	$147	D	Lan	CGN	N	Act	E5	EM	M	-	0	0	0	28	PMS	Per	Tag
4/8/97	inpt	upkp	$147	D	Lan	CGN	N	Act	E4	EM	M	-	0	0	0	28	PMS	Per	Tag
4/8/97	yard	ovhl	$147	D	Lan	LPD	N	Act	E5	HT	M	30	0	0	0	120	Grind	Mat	n/a
4/9/97	inpt	upkp	$147	D	Lan	AS	N	Act	E3	SN	F	20	0	0	0	12	Hsekp	Per	oth
4/9/97	inpt	upkp	$147	D	Pac	LSD	N	Act	E4	MM	M	33	0	0	0	-	Maint	Per	PPE
4/10/97	inpt	upkp	$147	D	Pac	AS	N	Act	E3	DC	F	19	0	0	0	18	Maint	Per	oth
4/11/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	MS	M	30	0	0	0	24	Hsekp	Per	both
4/12/97	inpt	upkp	$147	D	Pac	DDG	N	Act	E4	FC	M	21	0	0	0	6	PMS	Per	own
4/15/97	yard	ovhl	$147	D	Lan	LPD	N	Act	E3	AB	M	24	0	0	0	1	Rehab	Per	Tag
4/15/97	u/w	ISE	$147	D	Lan	DDG	N	Act	E4	HT	M	23	0	0	0	43	PMS	Per	PPE
4/16/97	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	ET	M	24	0	0	0	42	PMS	Per	PPE
4/16/97	u/w	ISE	$230	D	Lan	FFG	N	Act	E5	BM	M	39	0	1	0	3	Maint	Per	PPE
4/16/97	u/w	ISE	$147	D	Pac	DD	N	Act	O4	LCDR	M	36	0	0	0	5	Wtch	Per	oth
4/17/97	inpt	upkp	$147	D	Pac	LST	N	Act	E3	RM	M	22	0	0	0	0	PMS	Per	both
4/17/97	u/w	ISE	$147	D	Lan	MCS	N	Act	E4	MM	M	23	0	0	0	30	Wtch	Mat	n/a
4/18/97	inpt	upkp	$147	D	Lan	DD	N	Act	E6	DC	M	37	0	0	0	5	Wtch	Per	own
4/26/97	u/w	flops	$147	D	Pac	CVN	N	Act	E4	AD	M	21	0	0	0	18	Wtch	Per	own
4/26/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AD	M	31	0	0	0	32	Maint	Per	Tag
4/28/97	inpt	upkp	$147	D	Lan	AS	N	Act	E3	MR	M	23	0	0	0	48	PMS	unk	n/a
4/28/97	inpt	upkp	$147	D	Lan	PC	N	Act	E6	EM	M	36	0	0	0	-	Maint	Per	Tag
5/1/97	u/w	ISE	$147	D	Lan	AFS	N	Act	E4	RM	M	23	0	0	0	10	Train	Per	own
5/2/97	u/w	ISE	$147	D	Pac	LHA	N	Act	E4	ET	M	21	0	0	0	16	PMS	Per	own
5/4/97	inpt	upkp	$147	D	Pac	DDG	N	Act	E6	MS	M	45	0	0	0	264	Hsekp	Per	oth
5/5/97	inpt	upkp	$920	C	Pac	DD	N	Act	E6	DS	M	35	0	0	2	-	Hsekp	Per	own
5/5/97	inpt	upkp	$147	D	Lan	MCM	N	Act	E3	FN	M	20	0	0	0	3	Maint	Per	PPE
5/5/97	u/w	flops	$147	D	Lan	CV	N	Act	E3	AMS	M	21	0	0	0	12	Wtch	Per	own
5/9/97	inpt	upkp	$147	D	Lan	MCM	N	Act	E6	EM	M	31	0	0	0	120	T/S	Per	both
5/9/97	inpt	upkp	$147	D	Pac	AS	N	Act	E3	TM	M	19	0	0	0	12	PMS	Mat	n/a
5/9/97	u/w	ISE	$147	D	Pac	CVN	N	Act	E4	AD	M	22	0	0	0	18	Maint	Per	own
5/10/97	u/w	ISE	$147	D	Pac	LHA	N	Act	E6	EN	M	32	0	0	0	-	Inspt	Per	Tag
5/16/97	inpt	upkp	$147	D	Pac	DD	N	Act	E6	EN	M	39	0	0	0	-	PMS	Per	PPE
5/16/97	u/w	unrep	$10,691	C	Lan	AE	N	Act	E4	GMG	M	24	1	0	22	42	Wtch	Per	own
5/17/97	u/w	ISE	$141,024	B	Pac	DD	N	Act	E4	MS	M	22	0	0	PPD	27	Fdprp	Per	both
5/20/97	u/w	ISE	$147	D	Pac	DDG	N	Act	E5	GSM	M	28	0	0	0	10	T/S	Per	PPE
5/20/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	EM	M	23	0	0	0	36	Maint	Per	PPE
5/20/97	inpt	upkp	$147	D	Pac	LPD	N	Act	E5	HT	M	44	0	0	0	18	Wtch	Per	own
5/21/97	u/w	ISE	$147	D	Lan	CV	N	Act	E5	AT	M	29	0	0	0	36	Maint	Per	own
5/21/97	inpt	upkp	$147	D	Pac	AS	N	Act	E4	MM	F	21	0	0	0	180	Maint	Per	own

Date	Loc	Type	Cost		Flt	Ship	N	Status	Rank	Rate	Sex	Age					Job		
5/22/97	u/w	ISE	$147	D	Pac	LSD	N	Act	E7	MM	M	36	0	0	0	-	Wtch	Mat	n/a
5/23/97	u/w	ISE	$147	D	Lan	CG	N	Act	E1	SR	M	-	0	0	0	1	Wtch	Per	Tag
5/23/97	u/w	ISE	$460	B	Lan	MHC	N	Act	E3	SN	M	25	0	0	1	-	Wtch	Envr	n/a
5/23/97	u/w	ISE	$460	B	Lan	MHC	N	Act	E2	SA	M	21	0	0	1	-	Wtch	Envr	n/a
5/23/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E3	FN	M	20	0	0	0	-	T/S	Per	Tag
5/28/97	u/w	flops	$147	D	Pac	CGN	N	Act	E5	AE	M	22	0	0	0	8	Wtch	Mat	n/a
5/30/97	u/w	ISE	$147	D	Lan	FFG	N	Act	E4	SM	M	21	0	0	0	24	PMS	Per	own
5/31/97	inpt	upkp	$230	D	Lan	CG	N	Act	E4	ET	M	22	0	1	0	6	T/S	Per	both
6/1/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E6	EN	M	31	0	0	0	153	T/S	Per	Tag
6/2/97	yard	ovhl	$147	D	Lan	DD	N	Act	E2	OS	M	23	0	0	0	6	Hsekp	Per	own
6/3/97	u/w	flops	$147	D	Lan	MCS	N	Act	O3	LT	M	28	0	0	0	-	Wtch	unk	n/a
6/5/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E6	MM	M	28	0	0	0	-	Maint	Per	own
6/5/97	inpt	upkp	$147	D	Lan	FFG	N	Act	E2	EM	M	21	0	0	0	13	PMS	Per	Tag
6/5/97	u/w	ISE	$147	D	Pac	CV	N	Act	E5	AT	M	28	0	0	0	96	T/S	Per	own
6/5/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E3	EM	M	21	0	0	0	1	Dishes	Per	oth
6/7/97	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AT	M	21	0	0	0	48	Maint	Mat	n/a
6/8/97	inpt	upkp	$147	D	Lan	LCC	N	Act	E5	EM	F	25	0	0	0	-	PMS	Per	both
6/9/97	yard	ovhl	$147	D	Lan	LPD	N	Act	E5	QM	M	27	0	0	0	6	Grind	Per	own
6/10/97	u/w	ISE	$147	D	Pac	CV	N	Act	E6	HT	M	35	0	0	0	120	Weld	Per	PPE
6/10/97	u/w	flops	$147	D	Pac	LHA	N	Act	E6	ABH	M	31	0	0	0	126	Wtch	Per	own
6/12/97	inpt	upkp	$147	D	Pac	LSD	N	Act	E1	EM	M	20	0	0	0	6	Maint	Per	own
6/12/97	yard	conv	$5,171	C	Pac	DDG	N	Act	E4	GMM	M	19	1	14	3	1	Hsekp	Per	Tag
6/13/97	yard	ovhl	$147	D	Pac	CVN	N	Act	E3	AE	M	25	0	0	0	3	Maint	Per	Tag
6/16/97	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AS	M	27	0	0	0	72	Maint	Per	both
6/17/97	yard	ovhl	$147	D	Lan	MHC	N	Act	E3	BM	M	21	0	0	0	14	Rehab	Per	oth
6/17/97	yard	ovhl	$147	D	Lan	MHC	N	Act	E2	SA	M	19	0	0	0	3	Rehab	Per	oth
6/18/97	u/w	ISE	$147	D	Lan	CV	N	Act	E4	AE	M	22	0	0	0	36	PMS	Mat	n/a
6/18/97	inpt	upkp	$147	D	Lan	DD	N	Res	E4	MM	F	27	0	0	0	108	Maint	Per	Tag
6/18/97	u/w	ISE	$147	D	Lan	FFG	N	Act	E3	GSE	M	20	0	0	0	4	Maint	Per	Tag
6/18/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	BM	M	21	0	0	0	24	T/S	Per	both
6/18/97	u/w	flops	$147	D	Lan	CV	N	Act	E3	AMH	M	21	0	0	0	20	Wtch	Per	own
6/19/97	u/w	ISE	$147	D	Lan	FFG	N	Act	E4	SM	M	27	0	0	0	22	Wtch	Per	oth
6/19/97	u/w	ISE	$147	D	Lan	LSD	N	Act	E3	HT	M	21	0	0	0	36	Weld	Per	own
6/19/97	yard	ovhl	$147	D	Lan	CVN	N	Act	E4	AO	M	24	0	0	0	14	Maint	Per	own
6/20/97	u/w	ISE	$147	D	Pac	LSD	N	Act	E7	EN	M	31	0	0	0	22	Wtch	Mat	n/a
6/22/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	EN	M	28	0	0	0	14	PMS	Per	own
6/24/97	u/w	flops	$147	D	Lan	CVN	N	Act	E5	AE	M	26	0	0	0	10	PMS	Per	own
6/24/97	u/w	ISE	$147	D	Pac	LPD	N	Act	E3	DC	M	21	0	0	0	13	Hsekp	Per	own
6/24/97	u/w	ISE	$147	D	Pac	LSD	N	Act	E4	GSM	M	22	0	0	0	3	Maint	Per	own
6/24/97	anch	upkp	$147	D	Pac	LHD	N	Act	E5	MR	M	33	0	0	0	156	Maint	Mat	n/a
6/25/97	inpt	upkp	$147	D	Pac	CV	N	Act	E2	RM	M	21	0	0	0	-	Rehab	Per	oth
6/25/97	u/w	ISE	$147	D	Lan	LSD	N	Act	E5	HT	M	31	0	0	0	6	Inspt	Mat	n/a
6/27/97	inpt	upkp	$147	D	Lan	MCM	N	Act	E2	IC	M	19	0	0	0	2	T/S	Per	PPE
6/27/97	yard	ovhl	$147	D	Pac	CVN	N	Act	E3	AD	M	21	0	0	0	4	Rehab	Per	Tag
6/29/97	u/w	ISE	$147	D	Pac	LSD	N	Act	E5	RM	M	35	0	0	0	6	T/S	Per	own
6/30/97	yard	ovhl	$147	D	Pac	CVN	N	Act	E4	MM	M	24	0	0	0	36	Maint	Per	own
6/30/97	inpt	upkp	$147	D	Lan	FFG	N	Act	E4	EN	M	22	0	0	0	31	T/S	Per	own
6/30/97	u/w	ISE	$147	D	Pac	DDG	N	Act	O5	CDR	M	40	0	0	0	9	Wtch	Mat	n/a
7/1/97	inpt	upkp	$147	D	Pac	LPD	N	Act	E4	MM	M	21	0	0	0	30	Maint	Per	Tag
7/1/97	inpt	upkp	$147	D	Pac	LHD	N	Act	E3	AN	M	19	0	0	0	-	Hsekp	unk	n/a

7/3/97	inpt	upkp	$2,070	C	Pac	LHA	N	Act	E5	HT	M	23	0	7	1	60	Weld	Per	PPE
7/3/97	anch	upkp	$147	D	Lan	DD	N	Act	E4	RM	M	25	0	0	0	-	T/S	Per	Tag
7/4/97	inpt	conv	$147	D	Lan	LHD	N	Act	E6	NC	M	30	0	0	0	1	PMS	Per	oth
7/7/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	RM	M	20	0	0	0	13	T/S	Per	own
7/10/97	u/w	ISE	$147	D	Pac	LHD	N	Act	E6	AT	M	30	0	0	0	12	T/S	Per	Tag
7/11/97	u/w	ISE	$147	D	Lan	CV	N	Act	E5	AS	M	27	0	0	0	64	PMS	Per	PPE
7/12/97	u/w	ISE	$147	D	Pac	CV	N	Act	O3	LT	M	30	0	0	0	96	Wtch	Per	oth
7/14/97	inpt	s/a	$147	D	Pac	CVN	N	Act	E4	ET	M	23	0	0	0	-	T/S	Per	PPE
7/17/97	inpt	upkp	$460	C	Lan	AS	N	Act	E1	SR	M	19	0	0	1	1	Wtch	Mat	n/a
7/19/97	u/w	ISE	$147	D	Pac	CV	N	Act	E3	AT	M	22	0	0	0	9	PMS	Per	own
7/22/97	inpt	upkp	$147	D	Lan	AS	N	TAR	E4	EM	M	23	0	0	0	17	PMS	Per	both
7/22/97	u/w	s/a	$147	D	Pac	CG	N	Act	E3	EM	M	24	0	0	0	48	Hsekp	Per	PPE
7/24/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E2	DC	M	21	0	0	0	22	PMS	Per	Tag
7/25/97	inpt	upkp	$147	D	Pac	CVN	N	Act	E6	EM	M	33	0	0	0	-	Maint	Per	own
7/26/97	yard	upkp	$147	D	Pac	CVN	N	Act	E5	ET	M	23	0	0	0	18	Maint	Per	Tag
7/27/97	inpt	conv	$147	D	Lan	LHD	N	Act	E5	MS	M	34	0	0	0	108	Inspt	Per	Tag
7/27/97	u/w	ISE	$147	D	Lan	LPH	N	Act	E4	AT	M	24	0	0	0	19	Train	Per	own
7/29/97	inpt	upkp	$147	D	Lan	AGF	N	Act	E5	EW	M	23	0	0	0	75	T/S	Per	own
7/30/97	inpt	upkp	$147	D	Pac	DDG	N	Act	E6	MS	M	42	0	0	0	132	Fdprp	unk	n/a
8/4/97	anch	upkp	$147	D	Lan	CV	N	Act	E4	AT	M	23	0	0	0	14	Maint	Per	own
8/7/97	inpt	upkp	$147	D	Pac	DD	N	Act	E2	FA	M	23	0	0	0	8	T/S	Per	PPE
8/8/97	u/w	ISE	$147	D	Lan	AS	N	Act	E3	SH	F	21	0	0	0	1	Dishes	Per	own
8/12/97	inpt	upkp	$147	D	Lan	AO	N	Act	E3	FN	M	21	0	0	0	1	Maint	Per	PPE
8/13/97	inpt	upkp	$147	D	Lan	AS	N	Act	E4	HT	F	28	0	0	0	12	Weld	Per	PPE
8/15/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	MS	M	36	0	0	0	108	T/S	Per	Tag
8/15/97	inpt	upkp	$460	C	Lan	MHC	N	Act	E5	MN	M	26	0	0	1	-	Maint	Per	Tag
8/16/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	23	0	0	0	-	Maint	Per	Tag
8/17/97	u/w	ISE	$147	D	Lan	CV	N	Act	E4	MM	F	31	0	0	0	24	T/S	Per	both
8/18/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	MM	M	23	0	0	0	1	Wtch	Per	Tag
8/19/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	MS	M	-	0	0	0	-	Fdprp	Mat	n/a
8/20/97	u/w	ISE	$147	D	Lan	CV	N	Act	E3	AT	M	20	0	0	0	4	Wtch	Per	own
8/21/97	inpt	upkp	$147	D	Pac	DDG	N	Act	E4	EM	M	29	0	0	0	20	Maint	Per	Tag
8/21/97	u/w	flops	$147	D	Lan	CVN	N	Act	E5	AT	M	22	0	0	0	3	Wtch	unk	n/a
8/21/97	u/w	ISE	$147	D	Lan	FFG	N	Act	E4	GSE	M	28	0	0	0	12	Wtch	Mat	n/a
8/22/97	inpt	upkp	$147	D	Lan	CG	N	Act	E4	TM	M	25	0	0	0	-	PMS	Per	own
8/26/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	MM	M	24	0	0	0	70	PMS	Per	PPE
8/26/97	u/w	ISE	$147	D	Pac	DD	N	Act	E3	QM	M	22	0	0	0	24	Wtch	Mat	n/a
8/27/97	inpt	upkp	$147	D	Lan	LPD	N	Act	E6	HT	M	32	0	0	0	240	Weld	Per	PPE
8/27/97	u/w	flops	$147	D	Lan	CV	N	Act	E4	AT	M	24	0	0	0	3	Wtch	Per	oth
8/28/97	u/w	flops	$147	D	Lan	CV	N	Act	E5	AS	M	40	0	0	0	42	T/S	Per	Tag
8/29/97	inpt	upkp	$147	D	Lan	AS	N	TAR	E3	EM	M	21	0	0	0	18	Maint	Per	both
8/31/97	u/w	ISE	$147	D	Pac	DDG	N	Act	E5	EN	M	30	0	0	0	24	Wtch	Mat	n/a
9/1/97	yard	upkp	$147	D	Pac	CVN	N	Act	E3	ABH	M	20	0	0	0	4	T/S	Per	Tag
9/2/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E4	MM	F	26	0	0	0	2	Hsekp	Per	PPE
9/2/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	MS	M	19	0	0	0	5	Fdprp	Per	own
9/2/97	u/w	ISE	$147	D	Pac	AOE	N	Act	E5	BM	M	30	0	0	0	4	Maint	Per	oth
9/3/97	inpt	upkp	$147	D	Lan	CVN	N	Act	E3	PH	F	23	0	0	0	17	Maint	Per	oth
9/3/97	u/w	ISE	$147	D	Pac	DD	N	Act	E5	EM	M	32	0	0	0	144	T/S	Per	both
9/5/97	inpt	upkp	$147	D	Lan	AS	N	Act	E3	EM	M	21	0	0	0	12	Maint	Per	own
9/5/97	u/w	ISE	$147	D	Lan	LHD	N	Act	E2	FA	M	19	0	0	0	2	Hsekp	Per	Tag

9/6/97	u/w	ISE	$147	D	Lan	AO	N	Act	E2	MM	M	22	0	0	0	1	Hsekp	Per	own
9/7/97	yard	ovhl	$147	D	Lan	LHA	N	Act	E3	OS	M	20	0	0	0	-	T/S	Per	Tag
9/8/97	u/w	ISE	$147	D	Lan	CV	N	Act	E5	AS	M	34	0	0	0	6	T/S	Per	Tag
9/8/97	u/w	ISE	$147	D	Pac	DDG	N	Act	E4	EM	M	25	0	0	0	60	T/S	Per	PPE
9/9/97	yard	ovhl	$147	D	Lan	DDG	N	Act	E6	MS	M	38	0	0	0	42	Hsekp	Per	Tag
9/9/97	u/w	ISE	$147	D	Lan	FFG	N	Act	O3	LT	M	31	0	0	0	7	Train	Per	own
9/11/97	u/w	ISE	$147	D	Lan	DDG	N	Act	E6	OS	M	30	0	0	0	132	Maint	Mat	n/a
9/11/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AO	M	17	0	0	0	3	Wtch	Per	own
9/14/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	SN	M	19	0	0	0	3	Maint	Per	own
9/16/97	inpt	upkp	$147	D	Pac	LPD	N	Act	E4	MM	M	21	0	0	0	22	Maint	Per	Tag
9/18/97	u/w	ISE	$147	D	Pac	CVN	N	Act	E3	PH	M	22	0	0	0	3	Hsekp	Per	own
9/22/97	inpt	upkp	$147	D	Lan	MCS	N	Act	E3	AN	M	21	0	0	0	-	T/S	Per	Tag
9/23/97	inpt	upkp	$147	D	Pac	CG	N	Act	E7	EM	M	37	0	0	0	215	Inspt	Per	PPE
9/23/97	u/w	ISE	$147	D	Lan	CV	N	Act	E3	AT	M	20	0	0	0	12	Hsekp	Per	own
9/24/97	u/w	ISE	$147	D	Pac	CVN	N	Act	E5	ET	M	20	0	0	0	-	Train	Per	oth
9/26/97	inpt	upkp	$147	D	Pac	CV	N	Act	E4	ET	M	21	0	0	0	12	Maint	Per	Tag
9/27/97	u/w	ISE	$147	D	Lan	CG	N	Act	E4	STG	M	21	0	0	0	24	PMS	Per	PPE
9/30/97	inpt	upkp	$147	D	Pac	FFG	N	Act	E4	EM	M	24	0	0	0	72	T/S	Per	Tag
10/1/97	inpt	upkp	$147	D	Lan	AS	N	Act	E2	SA	M	25	0	0	0	12	Maint	Mat	n/a
10/1/97	inpt	upkp	$147	D	Pac	AS	N	Act	E4	DP	M	22	0	0	0	24	Maint	Per	Tag
10/8/97	u/w	ISE	$460	C	Lan	LHD	N	Act	E6	AT	M	-	0	0	1	12	Maint	Per	own
10/9/97	inpt	upkp	$147	D	Lan	LCC	N	Act	O3	LT	M	39	0	0	0	-	Maint	unk	n/a
10/10/97	inpt	upkp	$147	D	Lan	AS	N	Act	E6	ET	M	37	0	0	0	144	Hsekp	Per	own
10/14/97	u/w	ISE	$147	D	Pac	CG	N	Act	E2	OS	M	20	0	0	0	8	Wtch	Per	own
10/15/97	yard	upkp	$147	D	Lan	CG	N	Act	E3	FN	M	19	0	0	0	18	PMS	Per	Tag
10/15/97	yard	upkp	$147	D	Pac	FFG	N	Act	E5	EW	M	20	0	0	0	38	Maint	Per	own
10/15/97	u/w	ISE	$147	D	Lan	AS	N	Act	E1	MS	F	23	0	0	0	2	PMS	Per	Tag
10/20/97	inpt	upkp	$147	D	Pac	AS	N	Act	E4	EM	M	29	0	0	0	144	Maint	Per	Tag
10/22/97	inpt	upkp	$147	D	Pac	AS	N	Act	E1	ET	M	22	0	0	0	42	Hsekp	Per	oth
10/22/97	u/w	ISE	$147	D	Lan	AGF	N	Act	E3	MM	M	22	0	0	0	12	Maint	Per	both
10/24/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AT	M	22	0	0	0	6	Maint	Per	own
10/24/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	22	0	0	0	12	PMS	Per	own
10/27/97	u/w	ISE	$147	D	Pac	CG	N	Act	E2	ET	M	21	0	0	0	13	T/S	Per	Tag
10/29/97	yard	upkp	$147	D	Pac	DD	N	Act	E4	FC	M	23	0	0	0	36	DC	Per	PPE
10/30/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	DC	M	20	0	0	0	12	PMS	Per	Tag
11/6/97	u/w	ISE	$147	D	Pac	LPD	N	Act	E5	ET	M	24	0	0	0	42	PMS	Per	PPE
11/7/97	u/w	ISE	$230	D	Lan	LSD	N	Act	E4	EN	M	21	0	1	0	12	Maint	Per	PPE
11/9/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AMH	M	23	0	0	0	18	Maint	Per	own
11/10/97	u/w	s/a	$147	D	Lan	FFG	N	Act	E4	BM	M	23	0	0	0	36	Maint	Mat	n/a
11/12/97	inpt	upkp	$147	D	Lan	AO	N	Act	E5	MM	F	33	0	0	0	24	PMS	unk	n/a
11/12/97	u/w	ISE	$147	D	Pac	LPD	N	Act	E3	SN	M	20	0	0	0	-	Maint	Per	own
11/13/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	22	0	0	0	12	T/S	Per	own
11/14/97	u/w	ISE	$147	D	Pac	CG	N	Act	E5	RM	M	28	0	0	0	7	Maint	Mat	n/a
11/14/97	u/w	flops	$147	D	Lan	DD	N	Act	E4	AMH	M	24	0	0	0	72	Maint	Per	own
11/14/97	inpt	upkp	$147	D	Pac	DDG	N	Act	E4	RM	M	26	0	0	0	2	Dishes	Per	own
11/16/97	u/w	ISE	$147	D	Lan	DDG	N	Act	E5	GSM	M	22	0	0	0	44	Maint	Per	both
11/16/97	u/w	ISE	$147	D	Lan	DD	N	Act	E4	BM	M	24	0	0	0	42	Maint	Per	own
11/16/97	u/w	ISE	$147	D	Pac	LHA	N	Act	E4	ET	M	21	0	0	0	24	T/S	Per	own
11/17/97	inpt	upkp	$147	D	Lan	AS	N	Act	E2	SA	M	-	0	0	0	3	Wtch	Per	own
11/18/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	MM	M	28	0	0	0	24	Wtch	Per	Tag

11/18/97	inpt	upkp	$147	D	Pac	LSD	N	Act	E4	BM	M	26	0	0	0	19	Maint	Per	own
11/27/97	inpt	upkp	$147	D	Pac	CG	N	Act	E3	FN	M	20	0	0	0	21	Wtch	Per	own
11/28/97	inpt	upkp	$147	D	Pac	AS	N	Act	E3	FN	M	23	0	0	0	24	Maint	Mat	n/a
11/28/97	inpt	upkp	$147	D	Lan	FFG	N	Act	E4	EN	M	20	0	0	0	21	Maint	Mat	n/a
12/1/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	MS	M	35	0	0	0	5	Fdprp	Per	oth
12/2/97	inpt	upkp	$147	D	Lan	DDG	N	Act	E6	DC	M	33	0	0	0	132	Maint	Per	own
12/4/97	inpt	upkp	$147	D	Lan	DD	N	Act	E7	EM	M	38	0	0	0	228	Inspt	Per	Tag
12/4/97	inpt	ISE	$147	D	Lan	AS	N	Act	WO3	CWO	M	-	0	0	0	244	Train	Per	own
12/4/97	u/w	ISE	$147	D	Pac	CG	N	Act	E4	GSM	M	22	0	0	0	40	Hsekp	Per	both
12/5/97	u/w	flops	$147	D	Pac	CVN	N	Act	E3	IC	M	21	0	0	0	17	T/S	Per	both
12/5/97	u/w	ISE	$147	D	Pac	LHA	N	Act	E3	SN	M	24	0	0	0	42	Hsekp	Per	Tag
12/5/97	u/w	flops	$147	D	Pac	CVN	N	Act	O2	LTjg	M	24	0	0	0	20	Wtch	Per	oth
12/5/97	u/w	flops	$147	D	Pac	CVN	N	Act	O3	LT	M	36	0	0	0	120	Wtch	Per	oth
12/9/97	u/w	ISE	$147	D	Lan	DD	N	Act	E4	ET	M	22	0	0	0	28	T/S	Per	PPE
12/10/97	u/w	ISE	$147	D	Pac	CV	N	Act	E4	DC	M	23	0	0	0	8	T/S	Per	both
12/11/97	inpt	upkp	$147	D	Pac	AS	N	Act	E4	HT	M	-	0	0	0	60	Weld	Per	PPE
12/13/97	u/w	flops	$147	D	Lan	CVN	N	Act	E2	AT	M	-	0	0	0	6	Wtch	Per	own
12/15/97	inpt	upkp	$147	D	Lan	LHD	N	Act	E5	CT	F	27	0	0	0	1	PMS	Per	both
12/16/97	inpt	upkp	$147	D	Pac	CV	N	Act	E3	RM	M	20	0	0	0	6	T/S	Mat	n/a
12/18/97	inpt	upkp	$147	D	Lan	CG	N	Act	E6	FC	M	30	0	0	0	5	T/S	Per	PPE
12/18/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E3	AE	M	21	0	0	0	3	Maint	Per	own
12/23/97	u/w	ISE	$147	D	Lan	CVN	M	Act	E4	CPL	M	24	0	0	0	36	T/S	Per	PPE
12/27/97	u/w	ISE	$147	D	Pac	DD	N	Act	E5	CTM	M	23	0	0	0	60	T/S	Per	both
12/29/97	inpt	upkp	$147	D	Pac	AS	N	Act	E3	HT	M	21	0	0	0	5	Wtch	unk	n/a
12/29/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E4	AT	M	22	0	0	0	24	T/S	Per	Tag
12/29/97	u/w	ISE	$147	D	Lan	CVN	N	Act	E5	AT	M	23	0	0	0	24	T/S	Per	both
12/30/97	u/w	ISE	$147	D	Lan	CG	N	Act	E5	FC	M	22	0	0	0	41	Maint	Per	own

APPENDIX C. DOD COST STANDARD TABLES AND COST ESTIMATION TECHNIQUES

Department of Defense (DOD) Instruction 6055.7, April 10, 1989, "Mishap Investigation, Reporting, and Recordkeeping" provides guidance for investigation, reporting, and recordkeeping on mishaps and occupational illnesses. Enclosure 5, Attachment 1 of this instruction provides the "Cost Standard Table" for DOD agencies to determine personnel injury costs (DOD, 1989). Table C1 provides a condensed version of this table applicable to U.S. military personnel.

CY89$	Submarine and/or Flying Officer	Other Officers	Enlisted Personnel, Cadets
Fatality	$1,100,000	$395,000	$125,000
(flight crew member)			$270,000
Permanent Total Disability	$1,300,000	$845,000	$500,000
Permanent Partial Disability	$210,000	$145,000	$115,000
Lost Time Case (per day)	$425	$425	$375
Days Hospitalized (perday)	$466	$466	$466
No Lost Time Case (per day)	$120	$120	$120

Table C1. DOD Cost Standard Table for Personnel Injury (CY89$)

Cost figures for table C1 were provided in Constant Year 1989 (CY89) dollars. For the purpose of this study cost figures were converted to CY95 dollars to adjust for inflation and provide a more current estimate of personnel injury cost. The electrical shock mishap database contains data on mishaps from 1995 through 1997. Personnel injury cost figures for each year are calculated in CY95 dollars in order to provide a common Base Year for future year cost estimates. Inflation adjustments were made using MPN inflation indices provided by the Naval Center for Cost Analysis (NCCA, 1998).

Table C2 provides cost figures in CY95 dollars used for personnel injury cost estimation in this study. Cost for personnel injuries involving restricted activity days were calculated at half the cost of the lost time cases.

CY95$	Submarine and/or Flying Officer	Other Officers	Enlisted Personnel, Cadets
Fatality	$1,348,921	$484,385	$153,286
(flight crew member)			$331,099
Permanent Total Disability	$1,594,180	$1,036,217	$613,146
Permanent Partial Disability	$257,521	$177,812	$141,024
Lost Time Case (per day)	$521	$521	$460
Days Hospitalized (perday)	$571	$571	$571
No Lost Time Case (per day)	$147	$147	$147

Table C2. DOD Cost Standard Table for Personnel Injury (CY95$)

APPENDIX D. ELECTRICAL SHOCK MISHAP EVENT SUMMARY

Month	1995	1996	1997	Totals
January	22	23	25	70
February	27	23	30	80
March	18	26	27	71
April	20	27	24	71
May	30	28	25	83
June	31	19	39	89
July	35	18	21	74
August	33	27	23	83
September	29	27	26	82
October	31	31	17	79
November	16	20	19	55
December	29	9	22	60
Totals	321	278	298	897

Table D1. Electrical Shock Mishap Event Summary

Month	1995	1996	1997	Totals
January	21	22	22	65
February	22	22	27	71
March	13	22	23	58
April	17	23	19	59
May	28	23	21	72
June	22	14	32	68
July	26	16	18	60
August	30	24	18	72
September	22	24	25	71
October	29	26	15	70
November	14	18	14	46
December	26	8	20	54
Totals	270	242	254	766

Table D2. Electrical Shock Human Factors Mishap Event Summary

Month	1995	1996	1997	Totals
January	1	1	3	5
February	5	1	3	9
March	5	4	4	13
April	3	4	5	12
May	2	5	4	11
June	9	5	7	21
July	9	2	3	14
August	3	3	5	11
September	7	3	1	11
October	2	5	2	9
November	2	2	5	9
December	3	1	2	6
Totals	51	36	44	131

Table D3. Electrical Shock Non-Human Factors Mishap Event Summary

APPENDIX E. COST DISTRIBUTION COMPUTER PROGRAM

```
function(costs, lambda){
#
# Function for estimating the distribution of electrical shock mishap event costs
#
        total <- rep(0, 1000)
        for(i in 1:1000) {
                n <- rpois(1, lambda)
                estcost <- sample(costs[, 1], size = n, replace = T)
                total[i] <- sum(estcost)
        }
        dput(total, file = "costdata")
}
```

`

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LIST OF REFERENCES

Adams, N., Barlow, A., & Hiddlestone, J. (1981). Obtaining ergonomics information about industrial injuries: A five-year analysis. Applied Ergonomics, 12(2), 71-81.

Adams, N., & Hartwell, N. (1977). Accident-reporting systems: A basic problem area in industrial society. Journal of Occupational Psychology, 50(2), 285-298.

Benner, L. (1975). Accident Investigations: Multilinear Events Sequencing Methods. Journal of Safety Research, 7(2), 67-73.

Benner, L. (1982). Accident Perceptions: Their Implications for Accident Investigators. Professional Safety, 11(2), 21-7.

Blake, R. (1963). Industrial Safety (3rd ed). Englewood Cliffs, N.J.: Prentice-Hall.

Colling, D. (1990). Industrial Safety: Management and Technology. Englewood Cliffs, New Jersey: Prentice Hall.

Comptroller General of the United States. (1979). How Can Workplace Injuries Be Prevented? The Answers May Be in OSHA Files: Report to the Congress: HRD-79-43. Washington, D.C.: General Accounting Office.

Department of Defense. (1989). DODINST 6055.7. Washington, DC: Author.

Department of the Navy. (1996). Electrician's Mate: NAVEDTRA 12164. Washington, DC: Naval Education and Training Program Management Support Activity.

Department of the Navy. (1997a). OPNAVINST 5100.19C. Washington, DC: Author.

Department of the Navy. (1997b). OPNAVINST 5100.10G. Washington, DC: Author.

Department of the Navy. (1997c). OPNAVINST 5100.23C. Washington, DC: Author.

Drury, C., & Brill, M. (1983). Human Factors in Consumer Product Accident Investigation. Human Factors, 25(3), 329-342.

Edwards, M. (1981). The design of an accident investigation procedure. Applied Ergonomics, 12(2), 111-115.

Ferry, T. (1985). A Generic Approach to Mishap Investigation. Proceedings of the Seventh International Safety Conference, 2.7(2), 1-13.

Ferry, T. (1988). Modern Accident Investigation and Analysis. New York: Wiley.

Firenze, R. (1971). The Accident Process. National Safety News, 104(1).

Firenze, R. (1978). The Process of Hazard Control. New York: Kendall/Hunt.

Gaver, D. (1996). Analyzing point-event data. Unpublished Manuscript. Naval Postgraduate School, Monterey, California.

Goetsch, D. (1996). Occupational Safety and Health in the Age of High Technology (2nd ed.). Englewood Cliffs, New Jersey: Prentice Hall.

Hammer, W. (1972). Handbook of Systems and Product Safety. New Jersey: Prentice-Hall.

Hammer, W. (1976). Occupational Safety Management and Engineering. New Jersey: Prentice-Hall.

Hill, S., Byers, J., Rothblum, A., & Booth, R. (1994). Gathering and Recording Human-Related Causal Data in Marine and Other Accident Investigations. Proceedings of the Human Factors and Ergonomics Society 38th Annual Meeting, 863-867.

Heinrich, H., Peterson, D., & Roos, N. (1980). Industrial Accident Prevention: A Safety Management Approach (5th ed.). New York: McGraw-Hill.

Kletz, T. (1976). Accident data – the need for a new look at the sort of data that are collected and analyzed. Journal of Occupational Accidents, 1(1), 95-105.

Lacy, R. (1998). Human Factors Analysis of U.S. Navy Afloat Mishaps (Master's Thesis, Operations Research Department, Naval Postgraduate School, 1998).

Laughery, K., Petree, B., Schmidt, J., Schwartz, D., Walsh, M., & Imig, R. (1983). Scenario Analyses of Industrial Accidents. Sixth International System Safety Conference, 8(2), 1-21.

Laughery, K., & Schmidt, J. (1984). Scenario Analysis of Back Injuries in Industrial Accidents. Proceedings of the Human Factors Society 28th Annual Meeting, 471-475.

Laughery, K., & Brems, D. (1985). An Analysis of 4923 Industrial Accidents. Proceedings of the Human Factors Society 29th Annual Meeting, 536-540.

Mayer, D., & Ellingstad, V. (1992). Using Transportation Accident Databases in Human Factors Research. <u>Proceedings of the Human Factors Society and Ergonomics Society 36th Annual Meeting</u>, 965-969.

McElroy, F. (Ed.). (1974). <u>Accident Prevention Manual for Industrial Operations</u> (7th ed.). Chicago: National Safety Council.

Mintz, A. (1954). Time Intervals between Accidents. <u>The Journal of Applied Psychology, 38</u>(6), 401-406.

Monteau, M. (1977). <u>A practical method of investigating accident factors.</u> Luxembourg: Commission of the European Communities.

National Safety Council. (1975). Work Accident Records and Analysis. <u>National Safety News, 105</u>(2), 81-105.

National Safety Council. (1990). <u>Accident Facts.</u> Chicago: Author.

National Safety Council. (1991). <u>Supervisor's Safety Manual.</u> Chicago: Author.

Naval Center for Cost Analysis. (1998). <u>Inflation Indices and Outlay Profile Factors</u>. Washington, DC: Author.

Naval Safety Center. (1998, April-June). The Naval Safety Center's Afloat Magazine. <u>Fathom, 30</u>(3).

Naval Safety Center. (1997). <u>Command History</u>. Norfolk, VA: Author.

Naval Sea Systems Command. (1997). <u>Naval Ship's Technical manual Chapter 300 Electric Plant – General</u> (S9086-KC-STM-010/CH-300). Washington, DC: Author.

Perrow, C. (1984). <u>Normal Accidents.</u> New York: Basic Books.

Peterson, D. (1975). <u>Safety Management – A Human Approach.</u> Englewood, New Jersey: Aloray.

Pimble, J., & O'Toole, S. (1982). Analysis of Accident Reports. <u>Ergonomics, 25</u>(11), 967-979.

Raby, M., & McCallum, M. (1997). Procedures for Investigating and Reporting Fatigue Contributions to Marine Casualties. <u>Proceedings of the Human Factors and Ergonomics Society 41st Annual Meeting</u>, 988-992.

Ramsey, J. (1973). Identification of Contributory Factors In Occupational Injury. <u>Journal of Safety Research, 5</u>(4), 260-267.

Reason, J. (1990). Human Error. Cambridge, England: Cambridge University Press.

Ross, S. (1997). Introduction to Probability Models (6th ed.). San Diego, CA: Academic Press.

S-Plus 4.0 [Computer software]. (1998). Seattle, WA: Mathsoft Data Analysis Products Division.

Schmidt, J., Petree, B., & McDaniel, J. (1984). Eye Hazard Areas/Jobs: An Integrated Approach to Eye Protection. Proceedings of the Human Factors Society 28th Annual Meeting, 288-290.

Schmorrow, D. (1998). A Human Error Analysis and Model of Naval Aviation Maintenance Related Mishaps (Master's Thesis, Operations Research Department, Naval Postgraduate School, 1998).

Shappell, S., & Wiegmann, D. (1997a). A Human error approach to Accident Investigation: The Taxonomy of Unsafe Operations. The International Journal of Aviation Psychology, 7(4), 269-291.

Shappell, S., & Wiegmann, D. (1997b). Human Factors Analysis of Postaccident Data: Applying Theoretical Taxonomies of Human Error. The International Journal of Aviation Psychology, 7(1), 67-81.

Smith, R. (1976). The Occupational Safety and Health Act Its goals and its achievements. Washington, D. C.: American Enterprise Institute for Public Policy Research.

Society of Manufacturing Engineers. (1989). Manufacturing Management. Deaborn, MI: Author.

Suchman, E. (1961). A Conceptual Analysis of the Accident Phenomenon. Behavioral Approaches to Accident Research. New York: Association for the Aid of Crippled Children.

Teel, K., Du Bois, P. (1954). Psychological Research on Accidents: Some Methodological Considerations. The Journal of Applied Psychology, 38(6), 397-400.

U.S. Department of Labor. (1995). All About OSHA, OSHA 2056 (Revised). Washington, D.C.: Author.

Woolf, H. (Ed.). (1980). Webster's New Collegiate Dictionary. Springfield, Massachusetts: G. & C. Merriam Company.

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